PSGR
Krishnammal College for Women

DEPARTMENT OF BOTANY

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

(Semesters– I - V)

BACHELOR OF BOTANY
(2022 – 2025 Batch)

College of Excellence, nirf 2023-4th Rank
Autonomous and Affiliated to Bharathiar University
Reaccredited with A++ 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-V Sem)

Programme Learning Outcomes (PLO's)

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

PLO 1: Students will be able to remember, comprehend, apply, analyze and synthesize thecore 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 worktoacquire 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)
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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
	IIIA	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/	GE	4	56	4	3	50	50	100	4
			Allied Paper I -Mathematical for Sciences - I		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
	IIIA	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
III	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 study	-	-	-	100	-	100	Grade **
	III B	NM22UHR	Foundation Course-III (Universal HumanValues and Human Rights)	AEC	2	28	2	-	100	-	100	2
IV	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
III/IV	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	-	-				
IV	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	Finishing 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	-	Grade**	-	-	-	-
V	III	PL22C05	Core Paper V – Plant Taxonomyand Economic Botany	CC	4	58	2	3	50	50	100	4
	III	PL22C06	Core Paper VI- Genetics, Plant breeding and Biostatistics	CC	4	58	2	3	50	50	100	4
	III	PL21E01/ PL21E02/ PL21E03	**Elective I** Dietetics, Food Processing and Preservation/ Bioinoculants- Paper I/ Environmental Biotechnology	DSE	5	73	2	3	50	50	100	5
	III	PL22CP3	Core Practical III	CC	3+3+2	120	-	3	50˚	50˚	100	4
V/VI	III	PL22SBCE/ PL21SBP1	**Skill Based Course** Coursera Course – ClimateChange and Health: From Science to Action / **SBS-**Horticulture Practical	SEC	3	45/41	-/4	2	100	-	100	3
V	III	PL22AC1/ PL22AC2	**Advanced learners Course- #** Food Microbiology/ Nutrition Science	ACC	-	-	-	3	25	75	100	5$
	III	PL21PROJ	Project &Viva voce	DSE	4	60	-	Viva	50	50	100	5
	IV	NM21CS1	Cyber Security I	AECC	2	30	-	-	100	-	100	Gr.
	III	PL22COM	Comprehensive Examination	GC	--	--	--	1	--	100	100	Gr.
	IV	PL22INST	Fieldwork/Internship (15 days)	DSE	-	-	-	-	100	-	100	2
	VI	COM15SER	Community Services (30 hrs)	GC	-	-	-	-	-	-	-	Gr.
I-V	VI	16BONL1 16BONL2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-

CC – Core Courses **GE – Generic Elective**
CA – Continuous Assessment **AEC – Ability Enhancing Course**
DSE – Discipline Specific Elective **ESE - End Semester Examination**
SEC – Skill Enhancement Course **ACC-Additional Credit Course**
AECC - Ability Enhancement Compulsory Course **GC- General Courses**
Gr.-Grade **# - Self Study**
**** Outside regular class hours**
#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**
˚Core Practical CA & ESE will be evaluated for 100 converted into 50
$ Credits applicable to candidates who take up Advanced level Course examination

CIA PATTERN

1. Theory – 50:50 = 100 Marks

INTERNAL COMPONENT	50 Marks
CIA I	10 (Conducted for60 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
TOTAL	**50 Marks + ESE 50 Marks (Conducted for 100 Marks)**

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) : 12x3=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) : 12x5= 60

Total : 100 Marks

2. Practical - 50 : 50 = 100 Marks

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

3. Part IV
Value education / Environmental Studies/Design Thinking

INTERNAL COMPONENT	100 Marks
Quiz	50 Marks
Assignment	25 Marks
Project/Case study	25 Marks
Total	**100 Marks**

4. ALC 25/75 pattern:

Internal Component (Theory)	**25 Marks**
CIA	**10**
Model exam	**15**
Total	**25 marks**

ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4 : 16 Marks
Section B (Essay type) 1 out of 2 : 9 Marks
Total: 25 Marks

Advance Learner Courses (ALC)

Section A : 5 questions out of 8 - open choice 5x5 : 25 marks
Section B : 5 questions out of 8-open choice 5x10 : 50 marks
Total : 75 marks

5. Project: 50 / 50 = 100 Marks

Component	**100 Marks**
Internal Review I Review II Review III	 15 15 20
Total	**50 marks**
ESE Evaluation of Project Viva – voce examination	 30 20
Total	**50 marks**
Total	**100 Marks**

6. Skill Based Course:

INTERNAL COMPONENT	**100 Marks**
Test 1 (Theory / Practical)	30 marks (Conducted for 50 marks and
	converted to 30 marks)

Test 2 (Theory / Practical / Project)	50 marks
Lab performance	10 marks
Regularity	10 marks
Total	**100 Marks**

Students securing very low marks in internal assessment, only ESE mark will beconsider as passing criteria from third attempt onwards

7. Cyber Security

INTERNAL COMPONENT	**100 Marks**
Quiz	60 Marks
Case Study	20 Marks
Poster	20 Marks
Total	**100 Marks**

Mapping with Programme Learning Outcomes

Course 1-PL22C01

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

Course 2-PL22C02

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

Course 3-PL22CP1

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

Course 4-PL22C03

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

Course 5-PL22SB01

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

Course 6-PL22A01

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

Course7: PL22CO4

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

Course 8-PL22CP2

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

Course 9:PL22SB02

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

Course 10: PL21SBCE

Course 11: PL22A02

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

Course 12: PL22AP1

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

Course 13: PL22C05

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

Course 14: PL22C06

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

Course 15: PL21E01

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
CLO5.	S	S	S	S	S

Course 16: PL21E02

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
CLO5.	S	S	S	S	S

Course 17: PL21E03

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
CLO5.	S	S	S	S	S

Course 18: PL22CP3

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

Course 19: PL22AC1

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5

CLO1.	S	S	M	S	S
CLO2.	S	S	M	M	S
CLO3.	S	S	M	M	S
CLO4.	S	S	M	M	S
CLO5.	S	S	M	M	M

Course 20: PL22AC2

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

Course 21: PL21PROJ

Course 22: PL22SBCEA

Course 23:PL21SBP1

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

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 (7th 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). Stelar 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 andTypes of fossils - compression, impression, petrifaction, coal balls. Geological time scale. A detailed study of external and internal featuresand 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 I45 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	COURSENAME	Category	L	T	P	Credit
21PELS1	SEMESTER– II PROFESSIONAL ENGLISH FOR LIFE SCIENCES	-	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 ProgrammeOutcomes

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 questionlistening toInstructions
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 (TANSCHE)	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.	6th Edition, Sinauer Associates, Inc. Publishers - Sunderland, Massachusetts U.S.A.
2.	Clark, D. P., Paz dernik, N. J.	2012	Molecular Biology	Netherlands: Elsevier Science
3.	Ajoy Paul.	2011	Cell and Molecular Biology	3rd 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?	https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change	6
2.	Tropical Forest Landscapes 101: Conservation & Restoration	https://www.coursera.org/learn/tropicalforests101	20
3.	Climate change and Indigenous People and local communities	https://www.coursera.org/learn/climate-change-indigenous-communities	14
4.	Our Earth's future	https://www.coursera.org/learn/earth-climate-change	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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
NM22EVS	Foundation Course-II – Environmental Studies	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(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 embryosac (*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	

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	https://www.youtube.com/watch?v=03K82iPyWS0
2.	Unit II	Secretory tissues	https://www.youtube.com/watch?v=03K82iPyWS0
3.	Unit III	Anomalous secondary thickening in monocot stem – *Dracaena*	https://m.youtube.com/watch?v=lp4rIgsRdLc https://byjus.com/biology/ts-of-dracaena-stem/
4.	Unit IV	Defects in woods	https://www.youtube.com/watch?v=9zT3qaZJxIw
		Seasoning of woods	https://www.youtube.com/watch?v=qHzIWl7CS8E
5.	Unit V	Fertilization and Double Fertilization	https://www.youtube.com/watch?v=dgFY7WUTASQ
		Types of endosperm	https://www.youtube.com/watch?v=bUjVHUf4d1I

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 flowersand 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 entrepreneurshipconcept, 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

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?	https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change	6
2.	Tropical Forest Landscapes 101: Conservation & Restoration	https://www.coursera.org/learn/tropicalforests101	20
3.	Climate change and Indigenous People and local communities	https://www.coursera.org/learn/climate-change-indigenous-communities	14
4.	Our Earth's future	https://www.coursera.org/learn/earth-climate-change	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	https://www.youtube.com/watch?v=SiZiTeQ-nHk https://www.youtube.com/watch?v=LzFDghMoMRQ
		Secondary structure of dicot root	https://www.youtube.com/watch?v=bbgwE-h84iE
2.	Unit II	Types of endosperm	https://www.youtube.com/watch?v=EgiET_piGpA
		Development of dicot and monocot embryos	https://www.youtube.com/watch?v=DPcSTA3EUE4 https://www.youtube.com/watch?v=x26Fg8ltCGw

3.	Unit III	Osmosis and diffusion	https://www.youtube.com/watch?v=eeOcGX5qPp8 https://www.youtube.com/watch?v=iP6PtdhgzSk
		Transpiration	https://www.youtube.com/watch?v=zt9ja6p8q6U
		Plant growth regulators - Auxin, Cytokinin	https://www.youtube.com/watch?v=Py2O9rXENIg https://www.youtube.com/watch?v=DMWB9b58Rt4
4.	Unit IV	Medium preparation (MS medium)	https://www.youtube.com/watch?v=eMv_PMNPYMc
		Hardening and field transfer	https://www.youtube.com/watch?v=YodPROvjroU
5.	Unit V	Methods of sterilization	https://www.youtube.com/watch?v=Bh-ytzY5uVY
		Culture media-PDA, serial dilution techniques	https://www.youtube.com/watch?v=OLz9JOrJepU https://www.youtube.com/watch?v=Ppe_bgnPFHU

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, Pteridophytesand 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 SporangiumPteridophytes - *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	https://www.digimat.in/nptel/courses/video/109104109/L01.html
	DesignThinkingskills	https://www.youtube.com/watch?v=b-9Id-Jt_PI
UNIT II	Principles& Basis of DesignThinking	https://youtu.be/6-NRiom8K9Y
	DesignThinking hats	https://www.youtube.com/watch?v=bc-BvFQDmmk
UNIT III	Empathize	http://acl.digimat.in/nptel/courses/video/109104109/L02.html http://acl.digimat.in/nptel/courses/video/109104109/L03.html https://youtu.be/ls2mqHs02B0
UNIT IV	Define	http://acl.digimat.in/nptel/courses/video/10910410 9/L04.html https://youtu.be/veixQsRnZZU https://youtu.be/6-bDSKZJEAM
UNIT V	Ideate	http://acl.digimat.in/nptel/courses/video/109104109/L11.html http://acl.digimat.in/nptel/courses/video/109104109/L12.html http://acl.digimat.in/nptel/courses/video/109104109/L13.html
	Prototype	http://acl.digimat.in/nptel/courses/video/10910410 9/L15.html
	Testing	http://acl.digimat.in/nptel/courses/video/109104109/L16.html http://acl.digimat.in/nptel/courses/video/109104109/L17.html http://acl.digimat.in/nptel/courses/video/109104109/L18.html http://acl.digimat.in/nptel/courses/video/109104109/L19.html

JOB1753	**Job oriented course – Phytopharmaceutical science**	**Category**				**Credit**
		JOC				**--**

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, Alpiniagalanga, 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, 39thEdn. NiraliPrakahan, India.
2. Saharan, Moond, Chouhan and Gupta, 2008. Principles of Pharmacognosy, Agrobios, India.

Reference Books

1. Tyler, E.V., Brady,R.L.andRobbers,E.J., 1981. Pharmacognosy. 9thedn. Lea and Febiger, Philadelphia.
2. Trease,G.E. and E.C.Evans, 1983. Pharmacognosy. 12th edition, BailliereTindall, 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,Glycyrhiza glabra, Zingiberofficinalis, Gloriosa superba, Pongamiapinnata*and*Maducalongifolia.*

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C05	Core Paper V – Plant Taxonomy and Economic Botany	Theory	58	2	-	4

Preamble

- To acquire the fundamental knowledge, basic concepts and principles of plant systematic.
- To study the economically importance of the plants.

Course Learning outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the general features of Angiosperms and the terminologies used.	K1, K2, K3, K4
CLO2	Understand the history and concepts underlying various approaches to plant taxonomy and classification of angiosperms; scientific names and the rules governing their application.	K1, K2, K3, K4
CLO3	Comprehend major taxa and their identifying characteristics, and develop knowledge of the current taxonomy of major plant families.	K1, K2, K3, K4
CLO4	Develop a deep knowledge on economic importance of plants and herbarium preparation	K1, K2, K3, K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Unit I **12 hrs**

Plant Taxonomy: History of plant taxonomy, Herbarium techniques and specimen preparation, Digital herbarium and their significance, technical terms of plant description-plant types (Habit and Habitat) vegetative (root, stem and leaf) and reproductive (inflorescence flower and fruit) parts, preparation of floral diagram and floral formula.

Unit II **12 hrs**

Systems of classification: Artificial – Linnaeus; Natural – Bentham and Hooker; Phylogenetic– Arthur Cronquist, Modern APG system IV. Botanical Nomenclature – ICN – priority, typification, effective and valid publication and author citation.

Unit III **11 hrs**

A detailed study of the following families including economic importance-Annonaceae, Nymphaeceae, Capparidaceae, Tiliaceae, Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae, Rubiaceae, Asteraceae.

Unit IV **11 hrs**

A detailed study of the following families including economic importance-Sapotaceae, Apocynaceae, Asclepiadaceae, Verbenaceae, Lamiaceae, Amarantaceae, Euphorbiaceae, Orchidaceae, Liliaceae and Poaceae.

Unit V **12 hrs**

Economic Botany – The importance and uses of plant products – fibres: Cotton (*Gossypium hirsutum* L.) and Jute (*Corchorus olitorius* L.); food plants – rice (*Oryza sativa* L.) and potato (*Solanum tuberosum* L.); tannins and dyes –*Terminalia chebula* Retz. and *Indigofera tinctoria* L.; resins and gums- *Ferula asafoetida* L. and gum Arabic (*Acacia arabica* (L.f.) Willd); spices and condiments – Cardamom (*Elettaria cardamomum* Maton.) and Clove (*Syzygium aromaticum* (L.) Merr. & L.M.Perry).

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Henry, A. N. and M. Chandrabose.	An aid to the International Code of Botanical nomenclature	Today and Tomorrow's Printers and Publisher, New Delhi	1st ed., 2009
2.	Simpson, M.G.	Plant Systematics	Academic Press, Newyork.	2nd ed 2011
3.	Sharma O.P.	Plant Taxonomy	Mc Graw Hill, New Delhi.	2nd ed., 1993
4.	Pandey, B.P.	Text book of Economic Botany	S. Chand & Company, New Delhi	5th ed., 1999
5.	Sambamurthy, A.V.V.S. and N.S.Subramanyam.	A Text book of Economic Botany	Wiley Eastern Limited, New Delhi	1st ed., 1989

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Gurucharan Singh	Plant Systematics: An Integrated Approach,	CRC Press	3rd ed., 2018
2.	Davis, P.H. and Heywood, V.M	Principles of Angiosperm Taxonomy	Oliver Boyd London	1st ed., 2011
3.	Michael G Simpson	Plant systematics	Academic Press	2nd ed., 2010

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

Course Designer

Dr. C. Krishnaveni
Dr. K. Kiruthika

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C06	Core Paper - VI Genetics, Plant breeding and Biostatistics	Theory	58	2	-	4

Preamble

- To study the Mendelian principles of genetics
- To study the inheritance pattern of characters
- To understand the breeding methods with specific objective
- To understand the quality trait of each crop
- To study the application of statistics in biology

Course Learning outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Understand the Mendelian principles, different types of inheritance pattern and basic statistics	K1,K2,K3
CLO2	Develop critical understanding of basis of genes and their interactions at population levels	K1,K2,K3
CLO3	Impart knowledge of objectives, quality traits and breeding methods for crop improvement	K1,K2,K3
CLO4	Develop analytical, quantitative and problem-solving skills from genetics and statistics	K1,K2,K3

Mapping with Programme Learning 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 I-Genetics **12 hrs**

*Mendelism- Mendel's Laws of heredity - Monohybrid and Dihybrid Cross; Test Cross and Back Cross. Deviation from Mendelian principle - Incomplete Dominance; Gene Interaction - Complementary, Supplementary, Duplicate and Inhibitory factors, Epistasis. Linkage- Complete and incomplete linkage and its importance.

Unit II- Genetics **11hrs**

Extra nuclear inheritance - Cytoplasmic Inheritance (plastid inheritance in *Mirabilis jalapa*, Polygenic Inheritance (skin colour in man and Kernel colour in wheat). Multiple Alleles (ABO

Blood Groups in Man); Sex Determination XX-XO, XX–XY methods.Sex determination in plants. Sex linked inheritance in Human – colour blindness and Haemophilia.

Unit III- Plant Breeding **12 hrs**

Objectives, Plant Introduction-types, procedure, purpose, merits and demerits, Hybridization Techniques-objectives, types, procedure-choice of parents, evaluation of parents, emasculation, bagging, tagging, pollination, harvesting and F_1generation. Heterosis and inbreeding depression (outline only).

Unit IV- Plant Breeding **11 hrs**

Methods of breeding for Self-pollinated, cross-pollinated and asexually propagated crops; pure line selection, mass selection and pedigree selection.

Breeding for crop Quality - Rice, Cotton and Tomato.Breeding for nutritional quality.Sources for quality traits. Vitamin A in tomato.

Unit V- Biostatistics **12 hrs**

Biostatistics: – definition, basic principles; Sample and sampling, Collection and representation of data-Tabulation of data, Graphical representation-Histogram, Line Diagram, Bar Diagram, and Pie chart. Measures of Central Tendency- Mean, Median and Mode; Measures of Dispersion – Range, Standard Deviation and Standard error. Students't' test, Chi-square test.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Gupta, P.K.	Genetics,	Rastogi Publications, Meerut. New Delhi	4th ed., 2014
2.	Verma, P.S. and Agarwal,V.K.	Cytology, Genetics and plant breeding	S.Chand& Co, New Delhi	2010
3.	Shukla, R.S. and Chandel, P.S.	Cytogenetics, evolution, Biostatistics and Plant Breeding	S. Chand & Co, New Delhi	3rd ed., 2009
4.	Singh, B.D	Plant Breeding:Principles and Methods	Kalyani Publishers, New Delhi	7thed., 2005
5.	Chaudhari, H.K.	Elementary Principles of Plant Breeding	Oxford – IBH, New Delhi	2nded., 1984

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Zar, J.H.	Biostatistical Analysis,	Pearson Publication. U.S.A.	4th ed., 2012
2.	Gardner, E.J, Simmons, M.J, Snustad, D.P	Principles of Genetics	Wiley-India.	8thed., 2008

3.	Strickberger, N.W.	Genetics	Macmillan Co. New York.	3rd ed., 1985

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

Course Designer

Dr. H. Rehana Banu, Dr. R. Sumathi, Dr. E.Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21E01	Dietetics, Food Processing and Preservation	Theory	73	2	-	5

Preamble

- To study the nutritive importance of food stuffs.
- To understand food security and RDA.
- To recognize the value of food processing methods.
- To gain knowledge in food preservation and packaging.
- To appreciate the methods of quality control.

Course Learning outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1.	Impart the knowledge on nutritive value of food stuffs and thevarious sources of food.	K1,K2,K3,K4,K5
CLO2.	Recognize diet basedfoods on the needs of people.	K1,K2,K3,K4,K5
CLO3.	Illustrate food processing methods.	K1,K2,K3,K4,K5
CLO4.	Apply the knowledge in preventing food spoilage.	K1,K2,K3,K4,K5
CLO5.	Employ good manufacturing practice.	K1,K2,K3,K4,K5

Mapping with Programme Learning 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
CLO5.	S	S	S	S	S

S- Strong; M-Medium

Syllabus

Unit I **14 hrs**

Introduction – Nutritive importance of proteins, carbohydrates, fats, vitamins and minerals. Food sources – Plant and animal food. Fermented vegetables. Milk Products. Nutritional requirements and food security.

Unit II **15 hrs**

Balanced diet, Recommended Dietary Allowances (RDA). Diet counseling. Menu planning. Nutritional and food requirements of infants, expectant mothers, lactating women and old ages. Diet therapy and therapeutic diets. Diet for obesity, cardiovascular disease and diabetes.

Unit III **14 hrs**

Food processing: processing of legumes, milk, vegetables, fruits, fish, meat, poultry and eggs. Food additives- mono-sodium glutamate, aspartame for flavor, enzymes for texture modification; synthetic/natural food coloring agents.

Unit IV **15 hrs**

Food preservation: Physical, chemical and biological methods - drying, cooling, freeze-drying, heating, curing, jellying, salting, pickling, smoking, canning, and irradiation, Ultra High Temperature (UHT). Food spoilage and food adulterants. Food sanitation- safe methods of handling food.

Unit V **15 hrs**

Packing of preserved foods: concepts, definition, significance, classification, Primary packaging materials, methods of packaging - vacuum packaging, Modified Atmosphere Packaging (MAP), Controlled Atmosphere Packaging (CAP) & bio-degradable packages. Quality control; food standards: Agricultural Marketing (AGMARK), Food Safety and Standards Authority of India (FSSAI), Prevention of Food Adulteration (PFA). Good laboratory practice (GLP) Good Manufacturing Practice. Nutrition information on labels.

The topics in bold shall be taught through Flipped mode of learning. The topics shall be studied by visiting a Food Processing Institute / Industry.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Srilakshmi, B.	Dietetics	New Age International Limited, Publishers, New Delhi	9th ed., 2024
2.	Gordon L. Robertson	Food Packaging Science and Technology	New age International Ltd. Publishers, New Delhi	1st ed., 2019
3.	Michael Saltmarsh, Mike Saltmarsh	Essential Guide to Food Additives	RSC Publishing, UK	1st ed., 2013
4.	James M Jay	Modern Food Microbiology	CBS Publishers & Distributors, New Delhi	4th ed., 2005

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition& Year of publication
1.	Winton, A. and Winton, K.B.	Milk and milk products	Agrobios, Jodhpur	1st ed., 2022
2.	Fellows, P.J.	Food processing technology: Principle and Practice	Woodhead Publishing, United Kingdom	4th ed., 2020
3.	William C Frazier, Dennis C Westoff	Food Microbiology	McGraw-Hill Publishing Company, New Delhi	5th ed., 2017
4.	Jung H. Han	Innovations in Food Packaging	Academic Press, Inc	2nd ed., 2014

Activities: Seminar, Assignment, Quiz and Institute/Industry visit
Flipped mode: online links

- https://www.youtube.com/watch?v=UWhkFYDB8J4
- https://www.youtube.com/watch?v=CkoOm4Lxmjk
- https://www.fssai.gov.in/home
- https://www.youtube.com/watch?v=JLDFMkpENzk

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

Course Designer

Dr. M. Kanchana Dr. K.S. Tamil Selvi; Dr. B.S Chitra Devi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21E02	AOS – II Bioinoculants Paper I	Theory	73	2	-	5

Preamble

- To study the classification of bioinoculants.
- To study the growth of microbes and their distribution like bacterial, fungal and algal bioinoculants.
- To understand the Microbial solubilization, ecto and endo mycorrhiza.

Course Learning outcome

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the type of bioinoculants	K1,K2,K3
CLO2	Recognize and appreciate soil as the medium for the growth of microbes and their diversity	K1,K2,K3
CLO3	Working of the different groups of bacterial, fungal and algal bioinoculants.	K1,K2,K3
CLO4	Use phosphorus mobilization, ecto and endomycorrhizal activities for improving plant growth	K1,K2,K3
CLO5	Analyse the microbial solubilization in silicates and zinc.	K1,K2,K3

Mapping with Programme Learning 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
CLO5.	S	S	S	S	S

S- Strong; M-Medium

Syllabus

Unit -1 **15 hrs**

Definition, Classification of fertilizers (synthetic fertilizers & organic manures), Bioinoculants, Microbial inoculants in Agriculture - contributions of microorganisms to soil fertility. Advantages and limitations of bioinoculants over chemical fertilizers.

Unit-II **15 hrs**

Soil as a medium for growth of plants- Soil microorganisms- Distribution of microorganisms in soil. Factors influencing the microbial populations in soil. Rhizosphere and mycorrhizosphere concept.

Unit-III **15 hrs**

Different groups of bioinoculants- bacterial, fungal and algal bioinoculants. Phosphate solubilizers- Aluminium/iron solubilisation – *Bacillus megaterium, Bacillus circulans*and *Pseudomonas* sp.

Unit-IV **14hrs**

Phosphorus mobilization in the soil– Mycorrhizal types – Endomycorrhiza, Ectomycorrhiza and Orchid mycorrhiza.

Unit- V **14 hrs**

Microbial solubilisation of silicates and zinc- Plant growth promoting rhizobacteria- application of silica nanoparticles as manures.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition& Year of publication
1	Satyanarayana, U	Biotechnology	Books and Allied Publishers. Ltd. Kolkatta	1st ed., 2005
2	Dubey, R.C.	A Text book of Biotechnology	S. Chand & Co, New Delhi	4th ed., 2004
3	Kumaraesan, V.	Biotechnology	Saras Publication,Nagercoil	1st ed., 2001

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Subba Rao, N.S	Advances in Agricultural Microbiology	Oxford and IBH Publ. Co., New Delhi.	3rd ed., 2020
2.	Subba Rao. N.S	Biofertilizers in Agriculture and Forestry	Oxford and IBH Publ. Co., New Delhi P.242	3rd ed., 2019
3.	Nutman, P.S.	Symbiotic nitrogen fixation in plants	Cambridge Univ. Press, London, P.584.	1976

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

Course Designer

Dr. R.Sumathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21E03	AOS III- Environmental Biotechnology	Theory	73	2	-	5

Preamble

- To study the biodiversity, conservation of endangered plants and Global biodiversity information system.
- To study the concepts, types, data structure of GIS.
- To understand the strategies for effluent treatment in different industries using microbes.
- To appreciate the types of IPR, biohazards and biosafety guidelines.

Course Learning outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Study the biodiversity types, conservation methods, endangered plants and Global biodiversity information system.	K1,K2,K3
CLO2	Concepts, types, data structure of GIS and output of geographical data.	K1,K2,K3
CLO3	Familiarize the sewage and waste water treatments at primary, secondary and tertiary levels.	K1,K2,K3
CLO4	Study the strategies for effluent treatment in different industries using microbes.	K1,K2,K3
CLO5	Analyze the types of IP, biohazards and biosafety guidelines.	K1,K2,K3

Mapping with Programme Learning 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
CLO5.	S	S	S	S	S

S- Strong; M-Medium

Syllabus

Unit -1-Biodiversity **15 hrs**

Definition; Geographical causes for diversity; Types of diversity: Genetic diversity, Species diversity and Ecosystem diversity; Quantifying biodiversity; importance of biodiversity; *in-situ*&*ex-situ* conservation; Gene banks; Cryopreservation; Assessing, analyzing and documenting biodiversity; Introduction to biodiversity database: Endangered plants, Endemism and Red data books; Global biodiversity information system.

Unit II-GIS and Environmental Monitoring **14 hrs**

Concept of Remote sensing; Concept of GIS; Types of Geographical Data; Data Structure; Vector and Raster data: their Advantages and Disadvantages; Input, verification, storage and output of geographical data; Importance of Geographical Information System in environmental studies.

Unit III - Effluent treatment systems **15 hrs**

Sewage and waste water treatments systems; Primary, secondary and tertiary treatments. Biological treatments- aerobic versus anaerobic treatments; Environmental pollution control-Bioremediation, Bioaugmentation and Biostimulation; Biofilms in treatment of waste water; Aerobic Biofilms; Bioreactors for Sewage and waste water treatments systems; Primary, secondary and tertiary treatments.

Unit IV- Removal of specific pollutants **14 hrs**

Physicochemical characteristics and treatment strategies for effluent generated by Distillary and Fermentation industry, Fertilizers and Pesticide manufacturing industries, Dyes and textile industries, Paper and pulp industries, Food and dairy industries. Bioremediation.

Unit V-IPR & Biosafety **15 hrs**

Types of Intellectual Property Rights (IPR): Patents, Trademarks, Copyright and Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.

Biosafety

Introduction to Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Recommended Biosafety Levels for Infectious Agents and Infected Animals; Biosafety guidelines - Government of India; Definition of Genetically Modified Organisms (GMOs) & Living Modified Organisms (LMOs).

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition& Year of publication
1.	Kumar.S.	Basics of Remote Sensing and GIS	Laxmi Publications, Chennai.	1st ed., 2019
2.	Acharya,N.K.	Text book on Intellectual Property Rights.	Jain Book Depot, New Delhi	7th ed., 2014
3.	Agarwal,S.K.	Environmental Biotechnology	APH Publishing Corporation	1st ed., 2009
4.	Sateesh.M.K	Bioethics and Biosafety	IK International Publishing House Pvt Ltd, New Delhi.	2008

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition& Year of publication
1	John R and Jenson	Remote Sensing of the Environment an Earth	Dorling Kindersly Pvt Ltd, New Delhi	2nded., 2009

		Resource Perspective:		
2	Marcos Von Sperling	Basic principles of Waste Water Treatment	IWA Publishing, Newyork	2007
3	Purohit S.S and Ranjan. R	Ecology, Environment and Pollution	Agrobios, India,Jodhpur	1st ed., 2003

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

Course Designer

Dr.R.Sumathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22CP3	Core Practical III (Core Paper V, VI & AOS I/II/III)	Practical	-	-	120	4

Preamble

- Collection, identification and preparation of herbarium
- To understand the factor interaction in plants and solve the problems involved in it.
- To apply common statistical tools to derive inference.
- To get acquainted with the techniques of food preservation

Course Learning outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1.	Identify the plants using taxonomically and to observe the economic importance	K3
CLO2.	Interpret the genetic problems and the hybridization techniques involved in plants	K3
CLO3.	Apply common statistical tools to derive inference.	K3
CLO4.	Analyze the nutritional quality and adulterants of various food stuffs	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Paper V - Plant Taxonomy and Economic Botany (45 hrs)

Plant Taxonomy:

Study of forms belonging to the families mentioned in the syllabus and submission of herbarium of 15 plants representing biological spectrum.

A field visit to study the vegetation and flora of the plants.

Economic Botany - Spotters:

Fruits-*Terminalia chebula* Retz., *Elettaria cardamomum* Maton., Leaves- *Indigofera tinctoria* L., Bast Fibre- *Gossypium hirsutum* L., Jute-*Chorchorus olitorius* L., Resin-*Ferula asafetida* L., Flower bud-*Syzygium aromaticum* (L.) Merr. & L.M.Perry, Tuber-*Solanum tuberosum* L., Grains-*Oryza sativa* L., Gum-*Acacia arabica* (L.f.) Willd.

Paper VI - Genetics, Plant breeding and Biostatistics (45hrs)

Genetics and Plant breeding: Simple problems in genetics. Hybridization techniques – different types of Emasculation, bagging, tagging.

Field visit to any one Plant breeding research Institutes-Sugarcane breeding institute/ central institute for cotton research, Coimbatore. IARI –Wellington/ Tamilnadu Agricultural University, Coimbatore.

Biostatistics -1. Mean, Median, Mode, Standard Deviation & Standard errors, 2. Students 't' test
3. Chi-square test

AOS I- Dietetics, Food Processing and Preservation (30 hrs)

Individual experiments:

1. Qualitative detection of nutrients in food:
    i. Carbohydrates
    ii. Proteins
    iii. Fats
    iv. Vitamins
    v. Minerals
2. Detection of Food additives
    i. Mono-sodium glutamate
    ii. Aspartame
3. Milk spoilage test.
4. Detection of Adulterants in oils and Fats.
5. Detection of Adulterants in spices and spices powder.

Demonstrations:

1. Fermented vegetables - Sauerkraut
2. Milk Products – Yoghurt, Cheese
3. Preparation of sample menu based on Recommended Dietary Allowance for:
    i. Infants
    ii. Expectant mother
    iii. Lactating women
    iv. Old age people
    v. Therapeutic Diets:
        a. Obesity
        b. Cardiovascular disease
        c. Diabetes
4. Preparation of low calorie diet.
5. Food preservation:
    i. Preparation of pickles
    ii. Preparation of jams
    iii. Preparation of jellies

iv. Canning & bottling of vegetable and fruit.

6. Isolation and identification of storage mycoflora from food stuffs/vegetables/fruits.

Or

AOS-II – Bioinoculants Paper I

1. Isolation of Rhizobium from legume root nodules; purification and characterization of Rhizobium.
2. Testing the efficiency- leonard jar technique and plant infection test.
3. Rhizobium strain identification by immunological methods.
4. Isolation of *Azospirillum* from rhizosphere.
5. Identification and characterization of *Azospirillum*.
6. Isolation of Phosphobacterium from soils.
7. Quantitative determination of Phosphate solubilization by phosphobacteria

Or

AOS-III- Environmental Biotechnology

a. Environmental Parameters

1. Estimation of halides in water samples by potentiometer.
2. Estimation of CO^{2+} and Ni^{2+} by colorimeter/spectrophotometer.
3. Estimation of sulphates by turbidometer.
4. Detection of heavy metals- Zinc, Cobalt, Cadmium, Lead, Ferrous in anyone of the polluted sample.
5. Sampling techniques: wastewater analysis for physico-chemical characteristics such as pH, conductivity, Total dissolved solids (TDS), Dissolved oxygen (DO), Biological oxygen demand (BOD), Chemical oxygen demand (COD), CO_2, alkalinity, nutrients, chlorides,hardness, set ability of solids.

b. Bioremediation

1. Microbial degradation of textile dyes/pesticides/hydrocarbons and oils
2. Assay of enzymes involved in biotransformation.
3. Phytoremediation of metal contaminated soil samples using Tomato/Brassica plants and estimation of metal removal in soil and metal accumulation in plants using Atomic Absorption Spectrum (AAS).
4. Pollutant removal using microorganisms from industrial effluent.
5. Effect of Heavy metals on microbial growth and microbial leaching of metals.
6. Effect of Pesticides on soil microorganism

Course Designers

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Dr. K.S. Tamil Selvi
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Dr. R. Sumathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22AC1	Food Microbiology	Theory	-	-	-	5

Preamble

- To understand the interaction between micro-organisms and food
- To understand the factors affecting the growth of microbes.
- To understand the contamination, preservation and spoilage of different foods
- To realize the microbes underlying food spoilage and food borne illnesses.
- To appreciate the role of government agencies involved in food sanitation and control

Course Learning 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 interaction between micro-organisms and food	K1
CLO2	Know the factors affecting the growth of microbes	K2
CLO3	Analyze the Contamination, preservation andspoilage of different foods	K3
CLO4	Realize the microbes underlying food spoilage and food borne illnesses.	K3
CLO5	Appreciate the role of government agencies involved in food sanitation and control	K3

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Unit I

Food and microorganisms- Food as a substrate, important microbes, contamination of food, principles underlying spoilage: chemical changes caused by microorganisms. Principles of food preservation: Asepsis, removal of microbes, maintenance of anaerobic conditions

Unit II

Contamination, preservation and spoilage of foods: cereals and cereal products; spoilage of sugar and sugar products, fruits and vegetables, milk and milk products.

Unit III

Contamination, preservation and spoilage of foods: meat– meat products; fish and other sea foods, eggs and poultry; canned foods and miscellaneous foods.

Unit IV

Foods and Enzymes from microorganisms. Food related diseases: food borne illness, food poisoning, toxins and intoxicants. Primary sources of food poisoning - bacteria and moulds. Prevention of food borne diseases.

Unit V

Microbiology in relation to food sanitation; enforcement and control agencies- International,national, state and private agencies.Microbiological criteria for foods.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	William C Frazier, Dennis C Westoff, Vanitha, K.N.	Food Microbiology	McGraw-Hill Education, New York.	5th ed., 2008
2.	Frazier C., D.C. Westhoff.	Food Microbiology	Tata McGraw Hill, New Delhi	4th ed., 2000
3.	Steinkraur K.H.	Indigenous Food Fermentation	Academic Press, New York	1st ed., 1988

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1	Adams, M.R and Moss, M.O.	Food Microbiology	New age International (P) Ltd. Publ., New Delhi	2nd ed., 1996
2	Benwart, G.J.	Basic Food Microbiology	CBS Publishers & Distributors, New Delhi	1st ed., 1987

Course Designer

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22AC2	Nutrition Science	Theory	-	-	-	5

Preamble

- To understand the vital link between nutrition and health
- To gain knowledge on functions of nutrients
- To understand the metabolism of nutrients
- To realize the importance of deficiency of nutrients
- To appreciate the role of government agencies involved in combating malnutrition

Course Learning 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 Vital link between nutrition and health	K1
CLO2	Acquire knowledge on functions of nutrients	K2
CLO3	Appreciate the Metabolism of nutrients	K2
CLO4	Relate the Importance of deficiency of nutrients	K3
CLO5	Comprehend the Role of government agencies involved in combating malnutrition	K3

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Unit I

Introduction to nutrition science– definitions and history. Nutritional importance of carbohydrates, proteins and fats.

Unit II

Energy metabolism– determination of energy value of food, determination of energy requirements, under nutrition and protein energy malnutrition

Unit III

Macro minerals functions and its deficiency disorders– Calcium and Phosphorus; micro minerals functions and its deficiency disorders– Iron, Iodine, Copper, Fluorine, Zinc and Chromium.

Unit IV

Vitamins functions and its deficiency disorders – Fat soluble - A, D, E and K; water soluble– Thiamin, Riboflavin, Niacin, Folic acid, Vitamin B complex and Vitamin-C

Unit V

Antioxidants, Water and electrolyte balance. Assessment of nutritional status, National nutrition policy. Role of International and National agencies in combating malnutrition. Computers in management of nutrition practice.

Text Books

S.No.	Author name	Title of the book	Publishers name	Edition & Year of publication
1.	Srilakshmi, B.	Nutrition Science.	New age International Ltd. Publishers, New Delhi.	4th ed., 2012
2.	Mudambi, R. Sumathy and Rajagopal, M.V	Fundamentals of food and nutrition	New age International Ltd. Publishers, New Delhi	4th ed., 2005
3.	Sheel Sharma	Human nutrition and Meal planning	Jnananda Prakashan, P&D, New Delhi	1st ed., 2000

Reference Books

S.No.	Author name	Title of the book	Publishers name	Edition& Year of publication
1.	Swaminathan, M.	Advanced textbook on food and nutrition	Bangalore printing and publishing company, Bangalore	2nd ed., 2002
2.	Arti Bhatia	Nutrition and Dietetics	Anmol Publications, PVT. LTD., NewDelhi	2000
3.	Sizer, Francis Sienkiewicz and Whitney Eleanar Whitney	Nutrition – concepts and controversies	Wadsworth, Australia	8th ed., 2000
4.	Srilakshmi, B	Food science	New age international ltd. Publishers, New Delhi.	1st ed., 1997

Course Designer

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

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21PROJ	Project and Viva-voce	Project	-	-	60	5

Preamble

To make the students to understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society and to educate and train the students to write scientific papers

Group Project &Viva Voce

Each group comprising of 5 members will be allotted to a staff Co-ordinator. A specific problem will be assigned to the students or they will be asked to choose a problem /area of their interest. The topic / area of work will be finalized at the end of the IV Semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried at the college or any other organization approved by the staff Co-ordinator and the HoD.

Area of work

Cytology, Plant Biology, Plant Biotechnology, Microbiology, Tissue culture and Medicinal Botany & Environmental Sciences, Food and nutrition.

Methodology

Each project should contain the following details:
Brief introduction on the topic
Review of literature
Materials and Methods
Experimental Results and Discussion – evidences in the form of figures, tables and photographs can be enclosed
Summary
Bibliography
The above content should not exceed 50 pages.

Evaluation *Internal evaluation of the project work will be carried out in stages as described below.*

I Review	Selection of the field of study, topic & literature collection	- 15 marks
II Review	Research design & data collection	-15 marks
III Review	Analysis & conclusion Preparation of rough draft	- 20 marks
	Total	**- 50 marks**

End Semester Examination

Evaluation of the project

Relevance of the topic to the academic / society		- 5 marks
Objectives		- 5 marks
Experimental design		- 10 marks
Expression of results and discussion		- 10 marks
	Total	**- 30 marks**

Viva voce

Presentation		-10 marks
Discussion		-10 marks
	Total	**-20 marks**
	Grand Total	**- 100 marks**

Viva Voce / presentation will be conducted by a panel of internalexaminers including the HoD and the staff Co- ordinator guiding theproject. A PowerPoint presentation by the group before theaudience will be evaluated on the basis of student's response toquestions.

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22SBCE	Coursera Course - Climate Change and Health: From Science to Action	Theory	45	-	-	3

S.No.	Topic of the Course	Link of the Course	Duration in hrs
1.	What is Climate Change?	https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change	6
2.	Tropical Forest Landscapes 101: Conservation & Restoration	https://www.coursera.org/learn/tropicalforests101	20
3.	Climate change and Indigenous People and local communities	https://www.coursera.org/learn/climate-change-indigenous-communities	14
4.	Our Earth's future	https://www.coursera.org/learn/earth-climate-change	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
PL21SBP1	Skill Based Subject- Horticulture Practicals	Practical	-	4	41	3

Preamble

- ✓ To understand the preparation of vermicompost to grow various horticultural crops
- ✓ To get skilled in various horticultural techniques

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	To gain knowledge on the various tools used in horticulture	K1
CLO2	To learn to prepare vermicompost and to construct vegetable garden	K2
CLO3	To learn cut flower techniques	K2
CLO4	Develop skills to propagate various horticultural crops	K3

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Practicals

1. Study of tools used in horticulture
2. Preparation of vermicompost
3. Build a vegetable garden
4. Cutting-leaf, root and stem cutting
5. Layering-simple and air layering
6. Grafting-splice and cleft grafting
7. Budding-T-patch and H-chip budding
8. Flower arrangement-Fresh and Dry Flowers
9. Microgreen cultivation
10. Hydroponics
11. Bonsai technique
12. Visit to nursery and gardens to get a detailed understanding on nursery management

Course Designer

Dr. K.S.Tamil Selvi; Dr. Sarah Jaison