PSGR
Krishnammal College for Women

DEPARTMENT OF BOTANY

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

(Semesters I-III)

BACHELOR OF BOTANY
(2024 – 2027 Batch)

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

BACHELOR OF BOTANY, 2024-2027 Batch, Semesters I-III
SYLLABUS & SCHEME OF EXAMINATION

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 the core concepts in Botany, like evolution, biodiversity, structure and function, information flow, exchange and storage, pathways and transformations of energy and matter.

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

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

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

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

PROGRAMME SPECIFIC OBJECTIVES (PSOs)
At the end of the programme the student will

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

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

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

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

PSO5: Gain career in teaching/research in Botany.

PSGR Krishnammal College for Women

BACHELOR OF SCIENCE -
BOTANY
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULUM FRAMEWORK (LOCF)

SYLLABUS & SCHEME OF EXAMINATION
2024-2027 Batch, Semesters I-III

Sem	Part	Subject Code	Title of the Paper	Course Type	Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2301/ HIN2301/ FRE2301	Language I Tamil Paper I/ Hindi Paper I/ French Paper I	L	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	E	6	88	2	3	25		100	3
	III	PL24C01	Microbiology & Plant Diversity I	CC	6	88	2	3	25	75	100	5
	III	PL24CP1	Botany Practical – I	CC	3	45	-	-	-	-	-	-
	III	CE24A01/ PS24A01	Chemistry for Biologists / Physics Paper	GE	4	58	2	3	20	55	75€	4
	III	CE23AP1/ PS23AP1	Chemistry for Biologists Practicals/ Practical Chemistry	GE	3	45	-	-	-	-	-	-
	IV	**Non Tamil Students**										2
		NME23B1 / NME23A1	Basic Tamil I/ Advanced Tamil I	AEC	2	28	2	-	100	-	100	
		Students with Tamil as Language										
		NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	
I-V	VI	COM15SER	Community Services	-	-	-	-	-	-	-	-	Gr.

II	I	TAM2302/ HIN2302/ FRE2302	Tamil Paper II/ Hindi Paper II/ French Paper II	L	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	E	5	73	2	3	25	75	100	3
	III	PL24C02	Plant Diversity II	CC	6	88	2	3	25	75	100	5
	III	PL24CP1	Botany Practical – I	CC	3	45	-	3	25	75	100	4
	III	CE24A02/ PS24A02	Chemistry for Biologists-II/ Physics Paper - II	GE	5	73	2	3	20	55	75€	4
	III	CE24AP1/ PS23AP1	Chemistry Practical for Biologists/ Physics Practical	GE	3	45	-	3	15	35	50#	2
	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
	IV	NME23B2/ NME23A2*	Basic Tamil II/ Advanced Tamil II	AEC	-	-	-	-	100	-	100	Gr.
I-II	VI	NM23GAW	General Awareness	AEC	SS	-	-	-	100	-	100	Gr.
I-IV	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	-
III	I	TAM2303/ HIN2303/ FRE2303	Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2403	English Paper III	E	5	73	2	3	25	75	100	3
	III	PL23C03	Cell and Molecular Biology	CC	5	73	2	3	25	75	100	5
	III	PL24CP2	Botany Practical II	CC	2	30	-	-	-	-	-	-
	III	CS23SBGP	Gen AI	SEC	3	44	1	-	100	-	100	3
	III	AS23A01	Invertebrata and Chordata	GE	5	73	2	3	20	55	75€	4
	III	TH24A19	Mathematics for Sciences I	GE	7	103	2	3	25	75	100	5
	III	AS23AP1	Zoology Practical	GE	2	30	-	-	-	-	-	-
	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
I-III	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

L – Language **E – English**
CC – Core Course **GE – Generic Elective**
AEC – Ability Enhancement Course **ACC – Additional Credit Course**
AECC – Ability Enhancement CompulsoryCourses
CA – Continuous Assessment **ESE–End Semester Examination**
Gr. – Grade **GC – General Course**
€ – CA conducted for 25 and converted into 20, ESE conducted for 75 and converted into 55
#– Allied Practical CA & ESE will be evaluated for 25/75 converted into 15/35
*** After class hours**

CA Question Paper Pattern and distribution of marksLanguage and English

Section A 5 x 1 (No choice) : 5 Marks
Section B 4 x 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 x 10 (2 out of 3) : 20 Marks (500 words)

Total : 45 Marks

CA Question from each unit comprising of

One question with a weightage of 2 Marks :2 x 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3 =15One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3 =24

Total : 45 Marks

End Semester Examination – Question Paper Pattern and Distribution of MarksLanguage and English

Section A 10 x 1 (10 out of 12) : 10 Marks
Section B 5 x 5 (5 out of 7) : 25 Marks (250 words)
Section A 4 x 10 (4 out of 6) : 40 Marks (600 - 700 words)

Total : 75 Marks

UG - Core and Allied courses:
ESE Question Paper Pattern: 5 x 15 = 75 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 5 Marks (Internal Choice at the same CLO level): 5 x 5 =25One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40
ESE Question Paper Pattern:(for Accounts Paper) 5 x 15 = 75 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 5 Marks : 5 x 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

Continuous Internal Assessment PatternTheory
I Year UG
CIA Test : 5 marks **(conducted for 45 marks after 50 days)**
Model Exam : 7 marks **(Conducted for 75 marks after 85 days (Each Unit 15 Marks))**
Seminar/Assignment/Quiz : 5 marksClass
Participation : 5 marks
Attendance : 3 marks
Total : 25 Marks
Practical
Lab Performance : 7 marks
Regularity : 5 marks
Model Exam : 10 marks
Attendance : 3 marks
Total : 25 marks
ESE Practical Pattern

The End Semester Examination will be conducted for a maximum of 75 marks respectively witha maximum 15 marks for the record and other submissions if any.

Part IV

Introduction to Entrepreneurship / Women Studies / Value education / Environmental Studies / Design Thinking

Quiz : 50 marks

Assignment :

25marks

Project / Case study : 25 marks

Total : 100 Marks

Professional English

The course offered in alignment with TANSCHE norms with 2 credits.Quiz (5 x 20 Marks) : 100 Marks

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL24C01	Microbiology & Plant Diversity I	Theory	88	2	-	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	Understand the cellular, biochemical, and physiological aspects of mircoorganisms and recognize the similarities and differences between microbial groups (bacteria, algae, fungi, protozoa, 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	K3
CLO4	Identify the causes, symptoms and control measures of plant diseases	K4
CLO5	Apply the artificial intelligence to the biological science	K5

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
CLO5	S	M	S	S	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* (Cyanophyceae), *Chlamydomonas & Oedogonium* (Chlorophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae) (developmental studies on sex organs not required). Economic importance of Algae.

Unit III: Fungi and Lichens **20 hrs**

General characteristics of Fungi. Classification (Alexopoulos and Mims, 1972). Detailed study of morphology and reproduction of *Albugo* (Oomycetes), *Saccharomyces* (Ascomycetes), *Penicillium* (Plectomycetes), *Puccinia* (Teliomycetes), *Polyporus* (Agaricomycetes) and *Aspergillus* (Eurotiomycetes) (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 **20 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 Artificial Intelligence **10 hrs**

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	Title of the Book	Publishers	Edition & Year of publication
1.	Singh V, Pandae P.C. & Jain, D.K	A Text Book of Botany	Rastogi Publications, Meerut	5th ed., 2023-2024
2.	Vashishta, B.R., Sinha, A.E and Singh, V.P	Botany for Degree Students : Algae	S Chand and Company Ltd., New Delhi	1st ed., 2015

3.	Sharma O.P	Algae	Tata Mc Graw-HillEducation	1st ed., 2011
4.	Sharma O.P	Fungi and allied microorganisms	Tata Mc Graw-HillEducation	3rd ed., 2024
5.	Purohit, S.S	Microbiology-Fundamentals & Applications	Rastogi Publications, Meerut	7th ed., 2017
6.	Pandey, B.P	College Botany Vol I	S Chand & Company, New Delhi.	5th ed., 2021
7.	Vashishta B.R./ Sinha A.K. & Kumar Adarsh	Botany for degree students Fungi	S. Chand and CompanyLtd., New Delhi	1st ed., 2016

Reference Books

S. No.	Authors	Title of the Book	Publishers	Edition & Year of publication
1.	Alexopoulos, CJ, Mims CW & Blackwell M	Introductory Mycology	John Wiley & Sons, NewYork	4th ed., 2007
2.	Gangulee, HC. & KarAK	College Botany, Vol-II	New Central Book Agency Pvt. Ltd.Calcutta.	4th ed., 2011
3.	Mehrotra, RS & Aneja, KR	An Introduction to Mycology	New Age International Private Limited, New Delhi	2nd ed., 2015

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

Course Designers

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

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL24C02	Plant Diversity II	Theory	88	2	-	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 Learning 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 Learning 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 **18hrs**

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

Unit II – Pteridophytes - I

17hrs

General characteristics, Classification of Pteridophytes (Sporne, 1975). Stelar evolution,homospory, heterospory and seed habit. Apogamy and apospory.Economic importance of Pteridophytes.

Unit III – Pteridophytes - II **17hrs**

A detailed study of morphology, anatomy and reproduction of *Psilotum*(Psilotaceae), *Lycopodium* (Lycopodiaceae), *Equisetum* (Equisetaceae) and *Marsilea* (Marsileaceae)

(developmental studies on sex organs not required).Origin and evolution of Pteridophytes.

Unit IV- Gymnosperms

18hrs

General characteristics, distribution and classification of Gymnosperms(Sporne, 1965). Detailed study of morphology, anatomy and reproduction of*Cycas* (Cycadaceae), *Pinus*(Pinaceae)and *Gnetum* (Gnetaceae)(developmental studies on sex organs not required). Economic importance of Gymnospermswith special reference to oil, resin, timber, etc.,

Unit V- Palaeobotany

18hrs

Fossils-fossilization process andtypes of fossils - compression, impression, petrifaction, coal balls. Geological time scale. Radiocarbon dating.A detailed study of external and internal featuresand reproduction in *Rhynia* (Rhyniaceae), *Lepidodendron* (Lepidodendraceae), *Lepidocarpon* (Lepidocarpaceae), *Calamites*(Calamitaceae)and *Williamsonia sewardiana*(Williamsoniaceae).

Text Books

S.No	Authors	Title of the book	Publishers	Edition&Year of publication
1.	Sharma O.P	Textbook Of Bryophyta	Medtech Science Press	1st ed., 2024
2.	Vasishta PC, Sinha AK &Anilkumar	Pteridophyta Botany For Degree Students	S Chand & Company, New Delhi	1st ed., 2015
3.	Vasishta PC, Sinha AK &Anilkumar	Botany for degree students	S Chand And Company Ltd., New Delhi.	1st ed., 2016
4.	Pandey, B.P	College Botany Vol II	S Chand & Company, New Delhi	8th ed., 2016

Reference Books

S.No	Authors	Title of the book	Publishers	Edition&Year of publication
1.	Arnold. C. A.	An Introduction to Palaeobotany	McGraw Hill Book Company,London	2nd ed., 2005
2.	Sporne, KR	The Morphology of Gymnosperms	Hutchinson & Co., London.	2nd ed., 1974
3.	Sporne, KR	The Morphology of Pteridophytes	Hutchinson & Co., London	4th ed., 2015
4.	Steward.N.Wilson& Rothwell, W. Gar	Palaeobotany and evolution of Plants	Cambridge University Press	2nd ed., 2010

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 CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL24CP1	Botany Practical – I	Practical	-	-	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 Learning 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 Learning 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 I **45 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

Microscopic observation of bacteria - Gram staining 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, Calamites* and *Williamsonia*

CourseDesigners

Dr. C. Krishnaveni

Dr. M. Kanchana

Dr. K.S. Tamil Selvi

Dr. H. Rehana banu

Dr.E. Uma

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
PL23C03	Cell and Molecular Biology	Theory	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 Learning 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 Learning Outcome

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 **15 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 **15 hrs**

Nucleic acids: DNA as genetic material, Structure (Watson and Crick Model), forms 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. Regulation of Gene expression- prokaryotes-operon concept- *lac* operon and *trp* operon. Post translational modifications.

Text Books

S.No.	Authors	Title of the book	Publishers	Year of publication & Edition
1.	Gupta, P.K.	Cell and Molecular Biology	Rastogi Publications	2017, II Edn
2.	Arumugam, N. & Meyyan, R.P.	Cell Biology, Molecular Biology & Genetics- Vol I	Saras Publications	2014, I Edn
3.	Verma, P.S. and Agarwal,V.K.	Cytology	S.Chand& Co, New Delhi	2018, XVI Edn
4.	Shukla, R.S. & Chandel, P.S.	Cytogenetics, evolution, Biostatistics and Plant Breeding	S. Chand & Co, New Delhi	2014, I Edn
5.	Verma. P.S. & Agarwal, V.K.	Cell biology, Genetics, Molecular Biology, Evolution and Ecology.	S. Chand and Company, New Delhi.	2022, II Edn

Reference Books

S.No.	Authors	Title of the book	Publishers	Year of publication & Edition
1.	Geoffrey M. Cooper & Robert E.Hausman	The Cell – A Molecular Approach	Sinauer Associates, Inc. Publishers - Sunderland, Massachusetts U.S.A.	2013, VI Edn
2.	Clark, D. P., & Paz dernik, N. J.	Molecular Biology	Netherlands: Elsevier Science	2018, III Edn
3.	Ajoy Paul	Cell and Molecular Biology	Books and Allied Pvt Ltd., Kolkatta	2011, III Edn
4.	De Robertis & De Robertis	Cell and Molecular biology	Lippincott Williams and Wilkins. UK	2017, VIII Edn

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 CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
PL24CP2	**Botany Practical II**	**Practical**	**-**	**-**	**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 learning 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 Learning 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

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.

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 CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
PL24A01	**Fundamentals of Botany I**	**Theory**	**73**	**2**	**-**	**4**

Preamble

- To study the characteristics and life cycle of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms
- To gain knowledge of biodiversity and their conservation
- To learn the horticulture techniques.

Course Learning 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	K1
CLO2	Know about characteristics and life cycle of angiosperms	K2
CLO3	Understand the concept of Plant Ecology, Biodiversity and their conservation	K3
CLO4	Appraise the horticulture techniques.	K4

Mapping with Programme Learning 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
CLO4	S	S	S	M	M

S- Strong; M-Medium

Syllabus

Unit I **15 hrs**

General characteristics and classification of Algae (Fritsch-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). Structure and reproduction of Usnea.

Unit II **15 hrs**

General characteristics and Classification of Bryophyte (Reimer, 1954)- Structure, Reproduction and Life cycle of *Riccia*. General characteristics and Classification of Pteridophytes (Sporne, 1975) - Structure, Reproduction and Life cycle of *Lycopodium*. General characteristics and Classification of Gymnosperms (Sporne,1965) - Structure, Reproduction and Life cycle of *Cycas.*

Unit III **15 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- Population and Community Ecology, Ecosystem-Definition, components-food chain, food web, ecological pyramid. Morphological and physiological adaptations of Xerophytes, Mesophytes, Hydrophytes. Biodiversity- definition; Scope & importance; loss of biodiversity and Conservation of Biodiversity-In-situ & Ex-situ conservation

Unit V **14 hrs**

Horticulture: scope and importance, irrigation methods, manures, vegetative propagation methods –cutting, layering and grafting techniques, Gardening and landscaping- lawns, indoor plants, rock garden, terrarium and topiary.

Text Books

S.No.	Authors	Title of the book	Publishers	Year of publication & Edition
1.	Srivastava, H.N	Algae	Pradeep Publications, Delhi	2004, X Edn
2.	Srivastava, H.N.	Fungi	Pradeep Publications, Delhi	2004, X Edn
3.	Srivastava, H.N.	Pteridophytes	Pradeep Publications, Delhi	2004, X Edn
4.	Pandey, P.B	Plant Anatomy	S. Chand & Co, New Delhi	2001, I Edn
5.	Singh, V. and Jain	Taxonomy of Angiosperms	Rastogi Publications, New Delhi	1985, II Edn
6.	Purohit S.S &Ranjan .R	Ecology, Environment and Pollution	Agrobios, India,Jodhpur	2003, I Edn

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication & Edition
1.	Sharma O.P.	Plant Taxonomy	Tata McGraw Hill Comp, New Delhi	2018, II Edn
2.	Pandey, B. P.	Taxonomy of Angiosperms	S. Chand & Co, New Delhi	2015, VI Edn

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

Course Designers

Dr. C. Krishnaveni
Dr. H. Rehana Banu
Dr.E.Uma

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
PL23AP1	Botany Practical	Practical	-	-	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 learning outcomes

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

CLO Number	CLO 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 Learning 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, Collenchyma and Sclerenchyma), Complex Tissues (Xylem and Phloem)

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

Sectioning

Anatomy- Primary structure of Dicot stem, root and leaf Primary structures of Monocot 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 and culture techniques –Pour plate, spread plate, streak plate & slant

Demonstration Experiments

Physiology – hill reaction

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

Spotters Microbiology – Fermentor

Course Designers

Dr.C.Krishnaveni

Dr. R. Sumathi

Dr.E.Uma

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
NM23DTG	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 learning outcomes

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 Learning 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)**

Design Thinking Overview: Introduction to Design Thinking and Design Research Strategies - Design Thinking Skills

UNIT– II **(6 Hours)**

Design Thinking Mindset- Principles of Design Thinking-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 and Techniques

UNIT–IV **(6 Hours)**

Define -Definition -Defining the Problem -Tools and Techniques-Journey mapping and Ideate - definition - Ideation techniques

UNIT–V **(6 Hours)**

Prototype-Definition-Prototype Alternate Solutions-Test the Solutions-Visualization-Story Telling - Cautions and Pitfalls - Best Practices

Text Books:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christian Mueller- Roterberg	Handbook of Design Thinking Tips & Tools for how to design thinking	Amazon Kindle Version	2018
2	Gavin Ambrose Paul Harris	Design Thinking	AVA Publishing Switzerland	2010
3	Sambrant Srivastava and Vijay Kumar	A Text Book of Design Thinking	Vayu Education of India	2022

Reference Books:

Sl.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Maurício Vianna Ysmar Vianna Isabel K. Adler Brenda Lucena Beatriz Russo	Design Thinking-Business Innovation	MJVPress	2011
2	Moritz Gekeler	A practical guide to design thinking	Friedrich-Ebert-Stiftung	2019
3	J.Berengueres	The Brown Book of Design Thinking	UAE University College, Al Ain	2014

Blended Learning Links

UNIT	TOPICS	LINK
UNIT I	Introduction to Design Thinking	https://www.digimat.in/nptel/courses/video/109104109/L01.html
	Design Thinking skills	https://www.youtube.com/watch?v=b-9Id-Jt_PI
UNIT II	Principles& Basis of Design Thinking	https://youtu.be/6-NRiom8K9Y
	Design Thinking 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/109104109/L04.html https://youtu.be/veixQsRnZZU https://youtu.be/6-bDSKZJEAM
	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
UNIT V	Prototype	http://acl.digimat.in/nptel/courses/video/109104109/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