SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY, MADURAI
RE-ACCREDITED WITH 'A' GRADE (THIRD CYCLE) BY NAAC WITH CGPA 3.11)

Programme Scheme, Scheme of Examination and Syllabi

(From 2023-2024 Batch onwards)

Department of Botany

PG Programme

Curriculum Design and Development Cell
Annexure O

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Programme Scheme, Scheme of Examination and Syllabi

(From 2023-2024 Batch onwards)

Department of Botany

PG Programme

Curriculum Design and Development Cell

HOD	Dean of Pure Science	Dean of Academic Affairs	Principal

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

DEPARTMENT OF BOTANY

MEMBERS OF BOARD OF STUDIES

S.No.	Board Members	Name and Designation
1.	Chairman of the Board	**Dr. M. Sujatha** Head & Assistant Professor Department of Botany Sri Kaliswari College (Autonomous), Sivakasi.
2.	University Nominee	**Dr. M. Jayalakshmi** Associate Professor & Head i/c Department of Immunology School of Biological Sciences Madurai Kamaraj University Madurai -625021
3.	Academic Expert 1.	**Dr.R. Ramasubbu** Assistant Professor Department of Biology The Gandhigram Rural Institute (Deemed to be University), Gandhigram Dindigul District.
4.	Academic Expert 2.	**Dr M.Venkatesan** Assistant Professor, Department of Botany, Sourashtra College, Madurai
5.	Industrialist	**Mr. R. Govindaraj** Sri Marutham Agro Biotech, Madurai
6.	Alumnus	**Ms. C. Karolinsobina** Mother Teresa University for Women Kodaikkanal
Members		
7.	Dr. R. Narayanaprakash	Guest Faculty in Botany
8.	Dr. M. Murugan	Assistant Professor of Botany
9.	Dr. A. Sarvalingam	Assistant Professor of Botany
10.	Mrs. G. Mareeshwari	Assistant Professor of Botany
11.	Dr. G. Varatharaju	Assistant Professor of Botany
12.	Dr. J. Sureshkumar	Assistant Professor of Botany
13.	Mr. E. Fredrickraja	Assistant Professor of Botany

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
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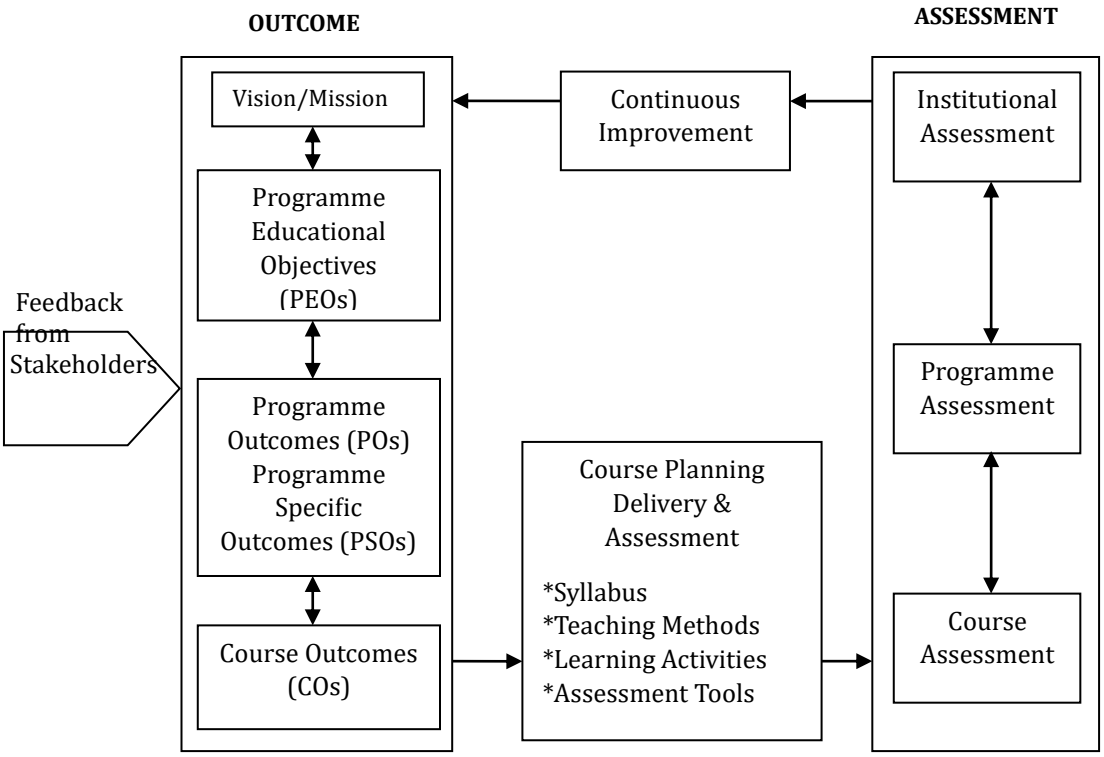
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
GUIDELINES FOR OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2023-2024 Batch onwards)

INTRODUCTION

Sri Kaliswari College in its pursuit of imparting quality education has marked a remarkable growth in terms of academic excellence, infrastructure, student strength, ICT facilities, library and placement records since its establishment in 2000-2001.This institution constitutes an academic community that is committed to encourage the student community to experience and share knowledge, identify their potential, enhance the employability skills and enable them to pursue their goals. After the conferment of autonomous status in the year 2012, the college has so far gone for revision of the syllabi three times and is continually updating the syllabi to meet the needs and demands of the student community.

The institution in its success journey of imparting quality education has been Re-Accredited with A grade (CGPA3.11) in its third cycle of Accreditation by NAAC. As an added feather to its cap, the institution has taken a giant leap to embrace the Outcome-Based Education system to enable the student community to develop their knowledge, skill and attitude simultaneously through a focussed learning and help the graduates to compete with their global counterparts and prepare them for life.

I. OUTCOME-BASED EDUCATION (OBE) FRAMEWORK



II. VISION OF THE INSTITUTION

- To impart quality higher education to produce highly talented youth capable of developing the nation

III. MISSION OF THE INSTITUTION

- Ensuring quality in all aspects of the activities
- Developing the latent skills of the rural youth
- Providing value - based education to instil courage and confidence
- Nurturing the entrepreneurial skills of the rural youth
- Creating competency to meet global challenges
- Imbibing social awareness and social responsibilities

IV. VISION OF THE DEPARTMENT

- To impart fundamental and modern knowledge of plant science and to create an environment to carryout innovative research work and conserve nature.

V. MISSION OF THE DEPARTMENT

- To develop the Department as a leading centre of Plant science at Local, Regional & National level
- To provide a student-centred and profession-oriented higher education and promote research work in the field of Plant Science
- To encourage rural youth to become competent and socially responsible professionals and entrepreneurs in the field of Plant Science

VI. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates will

PEO1: demonstrate in-depth knowledge in botany and succeed in academic and research careers in the field of plant science and interdisciplinary area of plant science.

PEO2: display knowledge in understanding research and addressing practical problems, possess critical skill and analytical reasoning in solving problems in workplace and in day to day life.

PEO3: exhibit excellent professional skills and ethical attitude to defend the global environment and professional issues with moral ethics.

PEO4: adopt new technologies and constantly upgrade their presentation and written skills and possess the critical acumen to be responsive to the societal needs through independent and life-long learning.

PEO5: demonstrate innovative ability and develop self employment by enhancing the practical skill, leadership skill and team spirit.

VII. PROGRAMME OUTCOMES (POs)

Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge and behavior that students acquire in their study through the programmes.

PO1: Disciplinary knowledge

Acquire specialized and Scientific knowledge in the field of science.

PO2: Critical thinking, Problem solving and Analytical reasoning

Engage in critical investigation through principle approaches or methods and draw realistic conclusions of problems by employing highly developed analytical and quantitative skills.

PO3: Scientific reasoning and Research related skills

En compares the skills involved in generates, testing and revising hypotheses or theories and draw appropriate conducting by coordinating empirical evidence and theory.

PO4: Communication skills and Digital literacy

Communicate effectively on scientific achievements, basic concepts and recent developments with society at large and make use of appropriate software to prepare project report.

PO5: Ethics, Values and Multicultural competence

Embrace ethical principles in all their activities, commit to professional and research ethics and practice tolerance and respect differences.

PO6: Team Work, Leadership and Employability skills

Recognize the opportunities and contribute positively in collaborative scientific research and acquire the pre-requisite skills required for placements and higher education.

PO7: Self-directed and Life-long learning

Recognize the need for engaging in independent and life-long learning in the emerging areas of the field of specialization.

VIII. PROGRAMME SPECIFIC OUTCOMES (PSOs) – M.Sc. BOTANY

On successful completion of M.Sc., Botany, the students will

PSO1: gain in-depth knowledge in plant science and develop biological facts in Plant Sciences

PSO2: develop critical thinking and analytical skill to understand concepts in Botany and bring innovation in plant science.

PSO3: obtain knowledge through various botanical field research and present scientific facts and develop best Researcher, Industrialist and Entrepreneur.

PSO4: inculcate the reading, writing and presentation skills. Apply statistical skills, Bioinformatics tool and analyze the biological data and use modern ICT tools necessary to decipher knowledge related to life sciences

PSO5: adhere to the principles of ethics in production and usage of organic farming and phyto-medicine in both professional and personal life.

PSO6: work effectively in groups with enhanced inter-personal skills and exhibit qualities associated with leadership to build a team. Imbibe Entrepreneurship skill necessary in the field of Bio-fertilizer, Mushroom Cultivation, Nursery technology and Vermi compost

PSO7: recognize the need to self improvement and engage in independent learning through Summer Training Programme, individual Project, courses by NPTEL, MOOC and involve in life-long learning and understand and adapt to the technological advancements in the emerging areas of plant science.

IX. PO-PSO Mapping Matrix – M.Sc. Botany

PSO / PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1	✓						
PO2		✓					
PO3			✓				
PO4				✓			
PO5					✓		
PO6						✓	
PO7							✓

X. PO-PEO Mapping Matrix – M.Sc. Botany

PEO / PO	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	✓	✓			
PO2		✓		✓	
PO3		✓		✓	
PO4		✓		✓	
PO5			✓	✓	✓
PO6		✓		✓	✓
PO7				✓	✓

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany

REGULATIONS

Duration of the Programme **:** Two years (equivalent to four semesters)

Eligibility

Candidate should have passed B.Sc. Botany or any other degree accepted by the Syndicate of the Madurai Kamaraj University, Madurai as its equivalent.

Medium of Instruction : English

Age Limit

Maximum age limit : No Age limit

Transitory Permission

Students joined from 2023 - 2025 may be permitted to write their examinations in this pattern up to April 2028.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SCHEME OF EXAMINATION

For all the PG Programmes, the internal and external marks are distributed as follows:

For all Theory Courses: Internal Marks: 25; External Marks: 75

For Courses with both Theory and Practical, assessment will be for both Theory and Practical.

For Skill Enhancement Professional Competency Course: Internal Assessment or 100 Marks in Online Mode will be conducted (Objective Type Questions)

For all Practical Courses, Project and Internship : Internal Marks: 25; External Marks: 75

Internal Mark Distribution for Theory Courses

Assessment Type	Marks	Scheme of Assessment
Internal Test	10 marks	Two Internal Tests and 1 Model Exam will be conducted and average of the best two will be considered
Written Assignment E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	5 marks	Any two of the Assignments will be given and the average of the two will be considered
Seminar	5 marks	One Seminar for each course
Viva/ Oral Exam/ Group Discussion/ Role Play	5 marks	Test will be conducted in any one of the Oral Mode

Internal Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work /Program Execution	15 marks	Two Internal Tests will be conducted and the average of the two will be considered
Observation/Record Notebook	5 marks	Assessment will be done during every practical class
Viva –Voce / Lab Quiz	5 marks	Two Lab Quiz Tests/viva-voce will be conducted and the average of the two will be considered

External Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work/Program Execution	65 marks	End result of the Practical
Viva –Voce	10 marks	Oral Mode Test

Internal Mark Distribution for Courses with both Theory and Practical

Assessment Type	Marks	Scheme of Assessment
Internal Test	10 marks	Two Internal Tests and 1 Model Exam will be conducted and average of the best two will be considered
Written Assignment E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	5 marks	Any two of the Assignments will be given and the average of the two will be considered
Lab work /Program Execution	10 marks	Two Internal Tests will be conducted and the average of the two will be considered

External Mark Distribution for Courses with both Theory and Practical

Assessment Type	Marks	Scheme of Assessment
External Written Test	50 marks	Two hours External Exam will be conducted for 50 marks
Lab work /Program Execution	20 marks	End result of the Practical
Viva –Voce	05 marks	Oral Mode Test

Internal Mark Distribution for Skill Enhancement Course

Assessment Type	Marks	Scheme of Assessment
Written Test	50 marks	One End Exam for 50 marks (2 hrs) will be conducted
Written Assignment E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	20 marks	Two Assignments for each course
Quiz	10 marks	One Quiz for each course
Seminar	10 marks	One Seminar for each course
Viva/ Oral Exam/ Group Discussion/ Role Play	10 marks	Test will be conducted in any one of the Oral Mode

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
UG Programme - M.Sc. Botany
QUESTION PAPER PATTERN

Internal Test – 40 Marks – 1 hr 45 mins Duration

S.No	Type of Questions	Marks
1.	Objective type Questions: Multiple Choice – 5 questions Answer in a Word/Sentence – 4 questions	 05 04
2.	Short Answer–2 questions –either or type	3x7=21
3.	Long Answer–1 question – either or type	1x10=10

Summative Examinations 75 Marks -3 hrs Duration

S.No	Type of Questions	Marks
1.	Objective type Questions: Multiple Choice – 5 questions Answer in a Word/Sentence – 5 questions	 05 05
2.	Short Answer - 5 questions – either or type	5x7=35
3.	Long Answer - 3 questions – either or type	3x10=30

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany

Attainment of Course outcomes

Attainment of Course outcomes is computed using Direct and Indirect assessment methods. Direct Method of Assessment is based on performance of the students in the Continuous Internal Assessment Tests, Summative Examinations and supporting activities such as Seminar, Assignment, Case study, Group Discussion, Quiz, etc and Indirect Method of Assessment is based on periodical feedback from the students at the end of each course.

Weightage of Direct and Indirect Assessment in computation of attainment of each course is 70% for Direct Assessment and 30% for Indirect Assessment.

Direct Assessment of Course outcome attainment

i) Rubrics:

Internal Assessment contributes 60% and Summative Examinations Assessment contributes 40% to the Direct Assessment of a course outcome for Theory Courses. For the Practical Courses, Internal Assessment contributes 70% and Summative Examinations Assessment contributes 30% to the Direct Assessment of a course outcome.

ii) Setting of Target:

50% of the maximum mark is set as target of Internal Assessment tools and the average mark of the class is set as target of Summative Examinations Assessment.

Formula for calculating percentage attainment of each course outcome

Based on the result of Summative Examinations and Internal Assessment tools, the number of students scoring more than the target is found out.

For each Internal Assessment Tools,

$$\text{Percentage attainment of each course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned course outcome}}{\text{Total Number of Students}} \times 100$$

$$\text{Percentage attainment of each Course outcome for Internal Assessment tools} = \text{Average of percentage attainment of all Internal Assessment tools}$$

For Summative Examinations,

$$\text{Percentage attainment of each Course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned CO}}{\text{Total Number of Students}} \times 100$$

Formula for calculating Attainment Percentage of Course outcome of a course

Percentage Attainment of Course outcome for Internal Assessment tools	=	Average of percentage attainment of all COs
Percentage Attainment of Course outcome for Summative Examinations	=	Average of percentage attainment of all COs

Final Direct Assessment of Course outcome Attainment

For Theory Courses

Percentage Attainment of Course outcome through Direct Assessment	=	(0.6 x percentage attainment of CO for internal assessment tool)+ (0.4 x percentage attainment of CO for summative examinations)

For Practical Courses

Percentage Attainment of Course outcome through Direct Assessment	=	0.7 x percentage attainment of CO for Internal Assessment tools + 0.3 x percentage attainment of CO for Summative Examinations

Indirect Assessment of CO Attainment

The course outcome feedback is conducted at the end of every semester by distributing structured feedback questionnaire to the students. The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for indirect attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment for each CO} = \frac{\text{Satisfaction Number}}{\text{Response Received}} \times 100$$

Percentage Attainment of CO of a course = Average of percentage attainment of all COs

Final Assessment of CO attainment

Average course attainment = 0.7 x Direct assessment of CO attainment
+ 0.3 x Indirect assessment of CO attainment

Expected Level of Attainment for each of the Course Outcomes

Percentage of CO Attainment	Level of Attainment
= 70% and above	Excellent
= 60% - <70 %	Very good
= 50% -< 60 %	Good
= 40% - < 50 %	Satisfactory
Below 40%	Not Satisfactory

Assessment of PO Attainment

At the end of the each programme, the Direct PO Assessment is done from the CO Attainment of all courses. The Direct PO Attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values.

$$\text{Weighted contribution of the course in attainment of each PO} = \frac{\text{Weighted Percentage of contribution of the course in attainmentof each PO} \times \text{average course attainment}}{100}$$

$$\text{Percentage attainment for each PO} = \frac{\text{Total weightage of all courses contributed to each PO}}{\text{Total weightage of all courses contributed to all POs}} \times 100 \times \text{weighted contribution of the course in the attainment of each PO}$$

Percentage Attainment of PO = Average of Percentage attainment of all POs

Expected Level of Attainment for each of the Programme Outcomes

Percentage of PO Attainment	Level of Attainment
= 70% and above	Excellent
= 60% - <70 %	Very good
= 50% -< 60 %	Good
= 40% - < 50 %	Satisfactory
Below 40%	Not Satisfactory

Attainment of Programme Educational Objectives (PEO)

PEOs are assessed after 3 to 4 years of graduation. Attainment is measured based on the Feedback from Stakeholders

1. Alumni
2. Parents
3. Employer

The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for Indirect Attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment of PEOs} = \frac{\text{Satisfaction number}}{\text{Response Received}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

Percentage of PEO Attainment	**Level of Attainment**
= 70% and above	Excellent
= 60% - <70 %	Very good
= 50% -< 60 %	Good
= 40% - < 50 %	Satisfactory
Below 40%	Not Satisfactory

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi

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DEPARTMENT OF BOTANY

PG Programme - M.Sc. Botany

CURRICULUM STRUCTURE

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

Courses	Sem I	Sem II	Sem III	Sem IV	Credits
Core Courses	6 (4) 6 (4) 5P (4)	4(3) 4 (3) 4 (3) 5P (3)	4 (4) 4 (4) 4 (3) 5P (4)	4 (3) 4 (3) 6 (4)	49
Project with Viva Voce	-	-	-	8 (7)	7
Core Industry Module	-	-	4 (3)	-	3
Elective Courses	5 (3) 5 (3)	3 (3) 3 (3) 4 (2) NME	3 (2) 3 (2) NME	4 (3)	21
Skill Enhancement Course	3 (2)	3 (2)	3 (2)	4 (2)	8
Internship/ Industrial Training	-	-	(2)	-	2
Extension Activity	-	-	-	(1)	1
Total Hours (Per week)/Credits	30(20)	30(22)	30(26)	30(23)	91 120

Self-paced Learning (Swayam Course)	-	-	2 Credits	-	2 Credits

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DEPARTMENT OF BOTANY

PG Programme - M.Sc. Botany

CURRICULUM PATTERN

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME CODE – PBY

Semester	Course Code	Course Name	Hours	Credits	Internal Marks	External Marks
I	23PBYC11	**Core Course - I:** Plant Diversity-I: Algae, Fungi, Lichens and Bryophytes	6	4	25	75
	23PBYC12	**Core Course - II:** Plant Diversity - II: Pteridophytes, Gymnosperms and Paleobotany	6	4	25	75
	23PBYC1P	**Core Course-III:** Practical: Plant Diversity I and II	5	4	25	75
	23PBYO11 23PBYO12 23PBYO13 23PBYO14	**Elective Courses Generic/ Discipline Specific - I:** 1. Microbiology, Immunology and Plant Pathology 2. Conservation of Natural Resources and Policies 3. Mushroom cultivation 4. Phytopharmacognosy	5	3	25	75
	23PBYO15 23PBYO16 23PBYO17 23PBYO18	**Elective Courses Generic/ Discipline Specific - II:** 1. Algal Technology 2. Ethnobotany, Naturopathy and Traditional Healthcare 3. Horticulture 4. Herbal Technology	5	3	25	75
	23PBYS11	**Skill Enhancement Course -I:** Nursery and Gardening	3	2	25	75
		Total	**30**	**20**		
II	23PBYC21	**Core Course - IV:** Plant Taxonomy of Angiosperms and Economic Botany	4	3	25	75
	23PBYC22	**Core Course - V:** Plant Anatomy and Embryology of Angiosperms	4	3	25	75
	23PBYC23	**Core Course-VI:** Ecology, Phytogeography, Conservation Biology and Intellectual property rights	4	3	25	75
	23PBYC2P	**Core Course - VII:** Practical: Plant Taxonomy	5	3	25	75

		of Angiosperms and Economic Botany and Plant Anatomy and Embryology of angiosperms and Ecology, phytogeography, Conservation Biology and Intellectual property rights				
	23PBYO21 23PBYO22 23PBYO23 23PBYO24	**Elective Courses Generic/ Discipline Specific - III:** 1.Medicinal Botany 2.Phytochemistry 3. Research methodology, computer applications and Bioinformatics 4.Biopesticide Technology	3	3	25	75
	23PBYO25 23PBYO26 23PBYO27 23PBYO28	**Elective Courses Generic/ Discipline Specific - IV:** 1. Applied bioinformatics 2. Biostatistics 3. Intellectual Property Rights 4. Nanobiotechnology	3	3	25	75
	23PBYN21	**Non-Major Elective Course - I:** Home Gardening	4	2	25	75
	23PBYS21	**Skill Enhancement Course - II:** Agriculture and Food Microbiology	3	2	25	75
		Total	**30**	**22**		
III	23PBYC31	**Core Course–VIII:** Cell and Molecular Biology	4	4	25	75
	23PBYC32	**Core Course –IX:** Genetics, Plant Breeding and Biostatistics	4	4	25	75
	23PBYC33	**Core Course–X:** Recombinant DNA Technology and Industrial applications	4	3	25	75
	23PBYC34	**Core Course –XI: Core Industry Module:** Industrial Botany	4	3	25	75
	23PBYC3P	**Core Course –XII:** Practical: Cell and Molecular Biology and Genetics, Plant Breeding and Biostatistics and Recombinant DNA technology and Industrial Applications	5	4	25	75
	23PBYO31 23PBYO32 23PBYO33 23PBYO34	**Elective Courses Generic/ Discipline Specific - V:** 1. Secondary Plant Products and Fermentation Biotechnology 2. Entrepreneurial Opportunities in Botany 3. Applied plant cell and tissue culture 4. Silviculture and Commercial Landscaping	3	2	25	75
	23PBYN31	**Non-Major Elective Course - II:** Mushroom Cultivation	3	2	25	75
	23PBYS31	**Skill Enhancement Course - III**: Plant	3	2	25	75

		Genomics				
	23PBYJ31	Internship/ Industrial Activity	-	2	25	75
		Total	**30**	**26**	-	-
IV	23PBYC41	**Core Course –XIII:** Plant Physiology and Plant Metabolism	4	3	25	75
	23PBYC42	**Core Course –XIV:** Biochemistry and Applied Biotechnology	4	3	25	75
	23PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant metabolism and Biochemistry and Applied Biotechnology	6	4	25	75
	23PBYJ41	**Core Course –XVI:** Project with Viva-Voce	8	7	25	75
	23PBYO41 23PBYO42 23PBYO43 23PBYO44	**Elective Courses Generic/ Discipline Specific - VI:** 1. Organic farming 2. Forestry and Wood Technology 3. Gene Cloning and Gene Therapy 4. Farm Sciences- Green Wealth	4	3	25	75
	23PBYS41 23PBYS42 23PBYS43	**Skill Enhancement Courses - IV**: **Professional Competency Course:** 1.Botany for NET/UGC-CSIR/SET/TRB competitive examinations /General Studies for UPSC/TNPSC/other competitive examinations 2.Botany for Advanced Research 3. Nanmudhalvan Scheme	4	2	100	-
		Extension Activity	-	1	100	-
		Total	**30**	**23**		

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DEPARTMENT OF BOTANY

PG Programme - M.Sc. Botany

CURRICULUM PATTERN

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME ARTICULATION MATRIX (PAM)

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	23PBYC11	**Core Course - I:** Plant Diversity-I: Algae, Fungi, Lichens and Bryophytes	14	14	12	14	11	13	13
	23PBYC12	**Core Course - II:** Plant Diversity - II: Pteridophytes, Gymnosperms and Paleobotany	14	14	13	14	14	14	13
	23PBYC1P	**Core Course-III:** Practical: Plant Diversity I and II	14	15	13	13	14	13	13
	23PBYO11 23PBYO12 23PBYO13 23PBYO14	**Elective Courses Generic/ Discipline Specific - I:** 1. Microbiology, Immunology and Plant Pathology 2. Conservation of Natural Resources and Policies 3. Mushroom cultivation 4. Phytopharmacognosy	15	15	13	13	15	12	14
	23PBYO15 23PBYO16 23PBYO17 23PBYO18	**Elective Courses Generic/ Discipline Specific - II:** 1. Algal Technology 2. Ethnobotany, Naturopathy and Traditional Healthcare 3. Horticulture 4. Herbal Technology	15	13	15	13	14	12	13
	23PBYS11	**Skill Enhancement Course -I:** Nursery and Gardening	14	14	11	14	11	11	9

II	23PBYC21	**Core Course - IV:** Plant Taxonomy of Angiosperms and Economic Botany	15	14	12	14	10	11	12
	23PBYC22	**Core Course - V:** Plant Anatomy and Embryology of Angiosperms	15	11	15	13	13	12	12
	23PBYC23	**Core Course-VI:** Ecology, Phytogeography, Conservation Biology and Intellectual property rights	15	14	13	14	13	12	13
	23PBYC2P	**Core Course - VII:** Practical: Plant Taxonomy of Angiosperms and Economic Botany and Plant Anatomy and Embryology of angiosperms and Ecology, phytogeography, Conservation Biology and Intellectual property rights	15	14	13	15	15	14	14
	23PBYO21 23PBYO22 23PBYO23 23PBYO24	**Elective Courses Generic/ Discipline Specific - III:** 1.Medicinal Botany 2.Phytochemistry 3. Research methodology, computer applications and Bioinformatics 4.Biopesticide Technology	15	11	13	15	15	13	12
	23PBYO25 23PBYO26 23PBYO27 23PBYO28	**Elective Courses Generic/ Discipline Specific - IV:** 1. Applied bioinformatics 2. Biostatistics 3. Intellectual Property Rights 4. Nanobiotechnology	14	14	14	14	15	13	13
	23PBYN21	**Non-Major Elective Course - I:** Home Gardening	11	7	9	10	8	9	11
	23PBYS21	**Skill Enhancement Course - II:** Agriculture and Food Microbiology	14	14	11	14	11	13	13
III	23PBYC31	**Core Course–VIII:** Cell and Molecular Biology	15	11	12	6	7	5	5
	23PBYC32	**Core Course –IX:** Genetics, Plant Breeding and	15	10	10	9	4	5	2

		Biostatistics							
	23PBYC33	**Core Course–X:** Recombinant DNA Technology and Industrial applications	15	10	10	9	4	5	2
	23PBYC34	**Core Course –XI: Core Industry Module:** Industrial Botany	12	13	11	9	9	12	08
	23PBYC3P	**Core Course –XII:** Practical: Cell and Molecular Biology and Genetics, Plant Breeding and Biostatistics and Recombinant DNA technology and Industrial Applications	13	11	8	8	10	7	6
	23PBYO31 23PBYO32 23PBYO33 23PBYO34	**Elective Courses Generic/ Discipline Specific - V:** 1. Secondary Plant Products and Fermentation Biotechnology 2. Entrepreneurial Opportunities in Botany 3. Applied plant cell and tissue culture 4. Silviculture and Commercial Landscaping	14	13	11	8	12	9	8
	23PBYN31	**Non-Major Elective Course - II:** Mushroom Cultivation	10	08	09	5	03	03	02
	23PBYS31	**Skill Enhancement Course - III**: Plant Genomics	12	13	8	10	7	5	6
	23PBYJ31	Internship/ Industrial Activity	8	12	4	7	01	05	08
IV	23PBYC41	**Core Course –XIII:** Plant Physiology and Plant Metabolism	13	12	12	8	04	04	05
	23PBYC42	**Core Course –XIV:** Biochemistry and Applied Biotechnology	12	10	9	10	8	3	6
	23PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant metabolism and	13	12	10	7	8	7	3

		Biochemistry and Applied Biotechnology							
	23PBYJ41	**Core Course –XVI:** Project with Viva-Voce	14	10	11	12	6	5	5
	23PBYO41 23PBYO42 23PBYO43 23PBYO44	**Elective Courses Generic/ Discipline Specific - VI:** 1. Organic farming 2. Forestry and Wood Technology 3. Gene Cloning and Gene Therapy 4. Farm Sciences- Green Wealth	11	14	7	7	10	10	11
	23PBYS41 23PBYS42 23PBYS43	**Skill Enhancement Courses - IV**: **Professional Competency Course:** 1.Botany for NET/UGC-CSIR/SET/TRB competitive examinations /General Studies for UPSC/TNPSC/other competitive examinations 2.Botany for Advanced Research 3. Nanmudhalvan Scheme	14	14	11	13	12	5	7
		Extension Activity	8	2	1	7	9	8	5
Total weightage of all courses contributing to PO			**399**	**359**	**321**	**325**	**293**	**270**	**264**

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi

(Affiliated to Madurai Kamaraj University, Re-accredited with 'A' grade (CGPA 3.11) by NAAC)

DEPARTMENT OF BOTANY

PG Programme - M.Sc. Botany

CURRICULUM PATTERN

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2023-2024 Batch onwards)

PROGRAMME ARTICULATION MATRIX – WEIGHTED PERCENTAGE

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	23PBYC11	**Core Course - I:** Plant Diversity-I: Algae, Fungi, Lichens and Bryophytes	3.62	4.06	3.7	4.65	4.23	5.28	5.68
	23PBYC12	**Core Course - II:** Plant Diversity - II: Pteridophytes, Gymnosperms and Paleobotany	3.62	4.06	4.01	4.65	5.38	5.69	5.68
	23PBYC1P	**Core Course-III:** Practical: Plant Diversity I and II	3.62	4.35	4.01	4.32	5.38	5.28	5.68
	23PBYO11 23PBYO12 23PBYO13 23PBYO14	**Elective Courses Generic/ Discipline Specific - I:** 1. Microbiology, Immunology and Plant Pathology 2. Conservation of Natural Resources and Policies 3. Mushroom cultivation 4. Phytopharmacognosy	3.88	4.35	4.04	4.3	5.66	4.86	5.91
	23PBYO15 23PBYO16 23PBYO17 23PBYO18	**Elective Courses Generic/ Discipline Specific - II:** 1. Algal Technology 2. Ethnobotany, Naturopathy and Traditional Healthcare 3. Horticulture 4. Herbal Technology	3.88	3.79	4.66	4.33	5.3	4.88	5.51
	23PBYS11	**Skill Enhancement Course -I:** Nursery and Gardening	3.62	4.08	3.42	4.67	4.17	4.47	3.81

II	23PBYC21	**Core Course - IV:** Plant Taxonomy of Angiosperms and Economic Botany	3.88	4.08	3.73	4.67	3.79	4.47	5.08
	23PBYC22	**Core Course - V:** Plant Anatomy and Embryology of Angiosperms	3.88	3.21	4.66	4.33	4.92	4.88	5.08
	23PBYC23	**Core Course-VI:** Ecology, Phytogeography, Conservation Biology and Intellectual property rights	4.94	4.08	4.04	4.67	4.92	4.88	5.51
	23PBYC2P	**Core Course - VII:** Practical: Plant Taxonomy of Angiosperms and Economic Botany and Plant Anatomy and Embryology of angiosperms and Ecology, phytogeography, Conservation Biology and Intellectual property rights	3.88	4.08	4.04	5	5.68	5.69	5.93
	23PBYO21 23PBYO22 23PBYO23 23PBYO24	**Elective Courses Generic/ Discipline Specific - III:** 1.Medicinal Botany 2.Phytochemistry 3. Research methodology, computer applications and Bioinformatics 4.Biopesticide Technology	3.88	3.23	4.04	4.97	5.62	5.26	5.88
	23PBYO25 23PBYO26 23PBYO27 23PBYO28	**Elective Courses Generic/ Discipline Specific - IV:** 1. Applied bioinformatics 2. Biostatistics 3. Intellectual Property Rights 4. Nanobiotechnology	3.63	4.12	4.36	4.64	5.62	5.24	5.46
	23PBYN21	**Non-Major Elective Course - I:** Home Gardening	2.85	2.06	2.8	3.31	3	3.63	4.62
	23PBYS21	**Skill Enhancement Course - II:** Agriculture and Food Microbiology	3.63	4.12	3.43	4.64	4.12	5.24	5.46
III	23PBYC31	**Core Course–VIII:** Cell and Molecular Biology	3.89	3.24	3.74	1.99	2.62	2.02	2.1
	23PBYC32	**Core Course –IX:** Genetics, Plant Breeding and	3.89	2.94	3.12	2.98	1.5	2.02	0.84

		Biostatistics							
	23PBYC33	**Core Course–X:** Recombinant DNA Technology and Industrial applications	3.89	2.94	3.12	2.98	1.5	2.02	0.84
	23PBYC34	**Core Course –XI: Core Industry Module:** Industrial Botany	3.11	3.82	3.43	2.98	3.37	4.84	3.36
	23PBYC3P	**Core Course –XII:** Practical: Cell and Molecular Biology and Genetics, Plant Breeding and Biostatistics and Recombinant DNA technology and Industrial Applications	3.39	3.23	2.51	2.66	3.66	2.8	2.48
	23PBYO31 23PBYO32 23PBYO33 23PBYO34	**Elective Courses Generic/ Discipline Specific - V:** 1. Secondary Plant Products and Fermentation Biotechnology 2. Entrepreneurial Opportunities in Botany 3. Applied plant cell and tissue culture 4. Silviculture and Commercial Landscaping	3.64	3.8	3.44	2.67	4.36	3.54	3.25
	23PBYN31	**Non-Major Elective Course - II:** Mushroom Cultivation	2.6	2.34	2.81	1.67	1.09	1.18	0.81
	23PBYS31	**Skill Enhancement Course - III**: Plant Genomics	3.12	3.8	2.5	3.33	2.55	1.97	2.44
	23PBYJ31	Internship/ Industrial Activity	2.04	3.39	1.23	2.28	0.36	1.93	3.15
IV	23PBYC41	**Core Course –XIII:** Plant Physiology and Plant Metabolism	3.31	3.39	3.7	2.61	1.45	1.54	1.97
	23PBYC42	**Core Course –XIV:** Biochemistry and Applied Biotechnology	3.05	2.82	2.78	3.26	2.9	1.16	2.36
	23PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant metabolism and	3.31	3.39	3.09	2.28	2.9	2.7	1.18

		Biochemistry and Applied Biotechnology							
	23PBYJ41	**Core Course –XVI:** Project with Viva-Voce	3.57	2.85	3.41	3.82	2.17	1.93	1.97
	23PBYO41 23PBYO42 23PBYO43 23PBYO44	**Elective Courses Generic/ Discipline Specific - VI:** 1. Organic farming 2. Forestry and Wood Technology 3. Gene Cloning and Gene Therapy 4. Farm Sciences- Green Wealth	2.81	3.95	2.18	2.23	3.57	3.79	4.23
	23PBYS41 23PBYS42 23PBYS43	**Skill Enhancement Courses - IV**: **Professional Competency Course:** 1.Botany for NET/UGC-CSIR/SET/TRB competitive examinations /General Studies for UPSC/TNPSC/other competitive examinations 2.Botany for Advanced Research 3. Nanmudhalvan Scheme	3.58	3.92	3.44	4.09	4.23	1.91	2.68
		Extension Activity	2.01	0.56	0.31	2.15	3.07	2.96	1.88
Total weightage percentage of course contributing to POs			100	100	100	100	100	100	100

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
CORE COURSE - I: PLANT DIVERSITY - I (ALGAE, FUNGI, LICHENS AND BRYOPHYTES) (23PBYC11)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 6 (L-5, T-1) **INT. MARKS : 25**
CREDITS : 4 **EXT. MARKS : 75**
DURATION : 90 hrs **MAX. MARKS : 100**

Course Objectives

- To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.
- To gain knowledge on economic importance of plant groups.
- To spark interest in the evolutionary roots of plant development.
- To study the reproductive processes of plant groups.
- To expose students to ecological importance of plant groups.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: relate the structural organizations of plant groups
CO2[K3]: estimate the diversity of basic life forms and their importance
CO3[K4]: compare the life cycle patterns in algae, fungi, lichens and Bryophytes
CO4[K5]: discuss the mode of reproduction in diverse groups of plant forms
CO5[K6]: predict the conservation and utilization of lower plant forms.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	2	3	2	3	2
CO2[K3]	3	3	2	2	3	3	3
CO3[K4]	2	2	3	3	1	2	3
CO4[K5]	3	3	3	3	3	2	2
CO5[K6]	3	3	2	3	2	3	3
Weightage of the course	14	14	12	14	11	13	13
Weighted percentage of course contribution to POs	**3.62**	**4.06**	**3.7**	**4.65**	**4.23**	**5.28**	**5.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(18 hrs)**

ALGAE: General account of algology, Contributions of Indian Phycologist (T.V.Desikachary, V.Krishnamurthy and V.S. Sundaralingam), Classification of algae by F.E. Fritsch (1935-45) & Silva (1982). Salient features of major classes: Cyanophyceae, Chlorophyceae, Xanthophyceae, Chrysophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenophyceae, Charophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae. Range of thallus organization, algae of diverse habitats, reproduction (vegetative, asexual and sexual) and life cycles. Phylogeny and inter-relationships of algae, origin and evolution of sex in algae.

Structure, reproduction and life histories of the following genera: Oscillatoria, Scytonema, Ulva, Codium, Diatoms, Dictyota and Gelidium.

UNIT II **(18 hrs)**

FUNGI: General Characteristics, occurrence and distribution. Mode of nutrition in fungi. Contributions of Indian Mycologists (C.V.Subramanian), Classification of Fungi by Alexopoulos and Mims (1979) & recent trends in the classification of fungi - Phylogeny and inter-relationships of major groups of fungi. General characters of major classes: Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina.

Structure, reproduction and life histories of the following genera: Plasmodiophora, Phytophthora, Rhizopus, Taphrina, Polyporus and Colletotrichum.

UNIT III **(18 hrs)**

LICHENS: Introduction and Classification (Hale, 1969). Occurrence and inter-relationship of phycobionts and mycobionts, structure and reproduction in Ascolichens, Basiodiolichens and Deuterolichens.

UNIT IV **(18 hrs)**

BRYOPHYTES: General characters and Classification of Bryophytes by Watson (1971). Distribution, Structural variations and evolution of gametophytes and sporophytes in Bryopsida, Anthoceropsida and Mosses. General characters of major groups - Marchantiales, Jungermaniales, Anthocerotales, Sphagnales, Funariales and Polytrichales. Reproduction - Vegetative and sexual, spore dispersal mechanisms in bryophytes, spore germination patterns in bryophytes.

Structure, reproduction and life histories of the following genera: Targionia, Lunularia, Porella and Polytrichum.

UNIT V **(18 hrs)**

ECONOMIC IMPORTANCE: Algae - Economic importance in Food and feed - Single cell protein, Industrial products (Agar-Agar, Carrageenan, Alginic acid, Iodine, biofertilizers, Vitamins and biofuel), Medicinal value and Diatomaceous

earth. Fungi – Economic importance in food, industries and medicine. Culturing and cultivation of mushrooms Pleurotus. Lichen –economic importance and as indicator pollution. Bryophytes – Ecological and economic importance – industry, horticulture and medicine.

TEXTBOOKS

1. Kumar, H.D. *Introductory Phycology*. Affiliated East-West Press, Delhi, 1999.
2. Barsanti, L. and Guadtieri, P. *Algae: Anatomy, Biochemistry and Biotechnology*, 2nd Edition, CRC Press, ISBN: 1439867321, 2014.
3. Sharma, O.P. *Fungi and Allied Microorganisms*, Mc Graw Hill, ISBN:9780070700383, 0070700389, 2011.
4. Pandey, P.B. *College Botany-1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology*, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi, 2014.
5. Sharma, O.P. *Bryophyta*, Mcgraw Hill, ISBN: 9781259062872, 1259062872, 2014.
6. Singh, Pandey and Jain. *A text book of Botany*, 5th Edition, Rastogi Publication, Meerut, 2020.

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1. Sundaralingam, V. *Marine algae*. Bishen Singh and Mahendra Pal Singh Publishers, Dehradun, 1991.
2. Edwardlee, R. *Phycology*, 5th Ed., Cambridge University Press, London, 2018.
3. Nash, T.H. *Lichen Biology*, Cambridge University press, 2008.
4. Johri, R.M., Lata, S. and Tyagi, K. *A Textbook of Bryophyta*. Dominant Publishers & Distributors Pvt., Ltd., New Delhi. ISBN: 9789384207335, 2012.
5. Alexopoulos, C.J. and Mims, M. *Introductory Mycology*. 4th Edition, Wiley Publishers, ISBN: 9780471522294, 2007.

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1. https://www.britannica.com/science/algae
2. https://en.wikipedia.org/wiki/Bryophyte
3. https://www.britannica.com/plant/bryophyte/Ecology-and-habits
4. https://www.livescience.com/53618-fungus.html.
5. http://www.uobabylon.edu.iq/eprints/paper_11_20160_754.pdf
6. https://www.youtube.com/watch?v=vcYPI6y-Udo
7. https://www.youtube.com/watch?v=XQ_ZY57MY64
8. http://www-plb.ucdavis.edu/courses/bis/1c/text/Chapter22nf.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
CORE COURSE - II: PLANT DIVERSITY - II: (PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY) (23PBYC12)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 6 (L-5, T-1) **INT. MARKS : 25**
CREDITS : 4 **EXT. MARKS : 75**
DURATION : 90 hrs **MAX. MARKS : 100**

Course Objectives

- To investigate the classification, reproduction and life history of pteridophytes and gymnosperms.
- To identify the dynamics of diversity to realize the importance of diversity.
- To aware students about the economic importance of plant groups.
- To study the phylogeny and paleontology of pteridophytes and gymnosperms.
- To learn about the concept of fossils and process of fossilization.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: explain about classification of pteridophytes and gymnosperms
CO2[K3]: elucidate morphological and anatomical of plant groups
CO3[K4]: explain the economic importance of pteridophytes and gymnosperms
CO4[K5]: criticize evolutionary relationship of pteridophytes and gymnosperms
CO5[K6]: generalize fossil types and fossilization records of pteridophytes and gymnosperms.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	3	3	2	3
CO2[K3]	3	3	3	3	3	3	3
CO3[K4]	2	3	3	3	3	3	2
CO4[K5]	3	3	2	3	3	3	2
CO5[K6]	3	2	2	2	2	3	3
Weightage of the course	14	14	13	14	14	14	13
Weighted percentage of course contribution to POs	**3.62**	**4.06**	**4.01**	**4.65**	**5.38**	**5.69**	**5.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(18 hrs)**

PTERIDOPHYTES: General characteristics and classification (Reimer, 1954). Range of structure, reproduction and evolution of the gametophytes, Gametophyte types – sex organs. Apogamy and Apospory. Life cycles. Stellar evolution. Heterospory and seed habit, Telome theory, morphogenesis, Economic importance of Pteridophytes.

UNIT II **(18 hrs)**

PTERIDOPHYTES: Structure, anatomy, reproduction and life histories of the following genera: Isoetes, Equisetum Angiopteris, Osmunda, Pteris and Azolla.

UNIT III **(18 hrs)**

GYMNOSPERMS: General characters - A general account of distribution of Gymnosperms. Morphology, anatomy, reproduction, phylogeny and classification (K.R.Sporne, 1965). Economic importance of Gymnosperms.

UNIT IV **(18 hrs)**

GYMNOSPERMS: Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of the following genera: *Thuja,Cupressus, Araucaria, Podocarpus, Gnetum* and *Ephedra*.

UNIT V **(18 hrs)**

PALEOBOTANY: Geological Scale; Radiocarbon dating; Contribution of Birbal Sahni to Paleobotany. Gondwana flora of India. Study of fossils in understanding evolution. Fossilization and fossil types. Economic importance of fossils – fossil fuels and industrial raw materials and uses. Study of organ genera: Rhynia, Lepidocarpon, Calamites,Cordaites and Lyginopteris.

TEXTBOOKS

1. Singh, V., Pande, P.C and Jain, D.K. *A Text Book of Botany*. Rastogi Publications, Meerut, 2021.
2. Sharma, O.P. *Pteridophyta*, McGraw Hill Education, New York, 2017.
3. Vashishta, P.C. Sinha, A.K and Anil Kumar. *Botany for Degree students. Gymnosperms*. S. Chand and Company Ltd., New Delhi, 2016.
4. Bhatnagar, S.P and Alok Moitra. *Gymnosperms*, New Age International (P) Ltd., Publishers, Bengaluru, 2020.
5. Vashishta. P.C., A.K. Sinha and Anil Kumar. *Botany for Degree students - Gymnosperms*. S. Chand and Company Ltd., New Delhi, 2018.

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1. Parihar, N.S. *An Introduction to Embryophyta Pteridophytes*. 5th Edition, Surjeet Publication, Delhi, 2019.

2. Pandey, S.N and Trivedi, P.S. *A Text Book of Botany* Vol. II- 12 th edition (Paper back), Vikas Publishing, 2015.
3. Rashid, A. *An introduction to Pteridophyta – Diversity, Development and differentiation* (2nd edition), Vikas Publications, 2013.
4. Sporne, K.R. *The morphology of Pteridophytes* (The structure of Ferns and Allied Plants) (Paper back), Andesite Press, 2017.
5. Sporne, K.R. *The Morphology of Gymnosperms*. Hutchinson & Co., London, 1967.
6. Taylor, E, Taylor, T, Krings, M. *Paleobotany: The Biology and Evolution of Fossil Plants*, 2nd Edition, Academic Press, 2008.

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1. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/
2. http://www.bsienvis.nic.in/Database/Pteridophytes-in-India_23432.aspx
3. https://books.google.co.in/books/about/Gymnosperms.html?id=4dvyNckni8wC
4. https://www.palaeontologyonline.com/
5. https://books.google.co.in/books/about/Paleobotany.html?id=HzYUAQAAIAAJ

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
CORE COURSE - III: PRACTICAL: PLANT DIVERSITY – I AND II (23PBYC1P)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 25**
CREDITS : 4 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To learn how to relate the use of instruments and methodologies to thallophytes and non-flowering plant groups.
- To enhance information on the identification of each taxonomical group.
- To comprehend the concepts and methods used to identify plant groups.
- To develop the technical abilities of staining, sectioning, and characterizing.
- To compare the structural diversity of fossil and extinct plant species.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: outline basic keys to identification of important algae and fungi
CO2[K3]: practice the skills for sectioning of pteridophytes and gymnosperms
CO3[K4]: identify the structural arrangements of plant groups
CO4[K5]: assess the structural diversity in the evolution of plant forms
CO5[K6]: estimate the techniques used to isolate and culture of alga and fungi as well as to understand the diversity of plant forms.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	2	3	3	3	3	2	3
CO2[K3]	3	3	2	3	3	2	3
CO3[K4]	3	3	3	3	3	3	2
CO4[K5]	3	3	2	1	2	3	2
CO5[K6]	3	3	3	3	3	3	3
Weightage of the course	14	15	13	13	14	13	13
Weighted percentage of course contribution to POs	**3.62**	**4.35**	**4.01**	**4.32**	**5.38**	**5.28**	**5.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

ALGAE: Study of algae in the field and laboratory of the genera included in theory.

External morphology and internal anatomy of the vegetative and reproductive structures of the following living forms: *Oscillatoria*, *Scytonema, Ulva, Codium, Diatoms, Dictyota* and *Gelidium* (depending on availability of the specimen).

To record the local algal flora–Study of their morphology and structure.

Identification of algae to species level (at least One).

UNIT II **(15 hrs)**

FUNGI: Study of morphological and reproductive structures of the following living forms: Plasmodiophora, Phytophthora, Rhizopus, Taphrina, Polyporus and Colletotrichum (depending on availability of the specimen).

Isolation and identification of fungi from soil, air, and Baiting method. Preparation of culture media. Cultivation of mushroom in the laboratory (Demonstration).

LICHENS: Study of morphological and reproductive structures of the genera Parmelia.

UNIT III **(15 hrs)**

BRYOPHYTES: External morphology and internal anatomy of the vegetative and reproductive organs of the following living forms: *Targionia, Lunularia, Porella* and *Polytrichum* (depending on availability of the specimen).

UNIT IV **(15 hrs)**

PTERIDOPHYTES: External morphology and internal anatomy of the vegetative and reproductive organs of the following living forms: *Isoetes, Equisetum Angiopteris, Osmunda, Pteris* and *Azolla* (depending on availability of the specimen).

Fossil slides observation: Rhynia, Lepidocarpon, Calamites.

UNIT V **(15 hrs)**

GYMNOSPERMS: External morphology and internal anatomy of the vegetative and reproductive organs of the following living forms: Thuja, Cupressus, Araucaria, Podocarpus, Gnetum and Ephedra (depending on availability of the specimen). Fossil slides observation: Cordaites and Lyginopteris.

TEXTBOOKS

1. Kumar, H.D. *Introductory Phycology*. Affiliated East-West Press, Delhi, 1999.
2. Das, S and Saha, R. *Microbiology Practical Manual*. CBS Publishers and Distributors (P) Ltd., New Delhi, India, 2020.

3. Sharma, O.P. *Pteridophyta*, Tata McGraw-Hills Ltd, New Delhi, 2012.
4. Sharma O.P and S, Dixit. *Gymnosperms*. Pragati Prakashan, 2002.
5. Johri, R.M, Lata, S, Tyagi, K. *A text book of Gymnosperms*, Dominate pub and Distributer, New Delhi, 2005.

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2. Webster, J and Weber, R. *Introduction to Fungi*, 3rd Ed. Cambridge University Press, Cambridge, 2007.
3. Sharma, O.P. *Bryophyta*, MacMillan India Ltd, New Delhi, 2017.
4. Ashok, M. Bendre and Kumar. *A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany*. Revised edition. Published by Rakesh Kumar Rastogi publication, 2010.
5. Gangulee, H.C and A.K. Kar. *College Botany*. Vth Edition. S. Chand, 2013.

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1. https://www.frontiersin.org/articles/10.3389/fmicb.2017.00923/full
2. https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf
3. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf
4. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4
5. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883
6. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - I: MICROBIOLOGY, IMMUNOLOGY AND PLANT PATHOLOGY (23PBYO11)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the concepts in microbiology, immunology, plant pathology and the etiology of specific plant diseases.
- To provide comprehensive knowledge about microbes and environment.
- To compare and analyze of major groups of microbes.
- To study the principles of immune system, vaccines and gene therapy methods.
- To enhance the knowledge for self-employment using microbial products.
- To appreciate the role of immune system in conferring disease resistance.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recognize the general characteristics of microbes
CO2[K2]: explain the disease development and defense mechanisms in plants
CO3[K3]: estimate concepts of microbial interactions with plant and humans
CO4[K4]: analyze the harmful and beneficial microbes and immune system
CO5[K5]: interpret the detection of pathogens and adaptive strategies

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	2	3
CO2[K2]	3	3	2	2	3	2	3
CO3[K3]	3	3	3	3	3	2	2
CO4[K4]	3	3	2	2	3	3	3
CO5[K5]	3	3	3	3	3	3	3
Weightage of the course	15	15	13	13	15	12	14
Weighted percentage of course contribution to Pos	**3.88**	**4.35**	**4.04**	**4.3**	**5.66**	**4.86**	**5.91**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

BACTERIA: Types of microorganisms. General characteristic of bacteria – Outline classification of Bergey's manual of 9th edition. Classification of bacteria based on Morphological, cultural, physiological and molecular characteristics. Bacterial growth – batch culture and continuous culture. Growth Curve. Factors affecting growth. Direct method: Haemocytometer, Viable plate count; Indirect method: Turbidity, Nutritional types.

Reproduction - Fission and sporulation. Genetic recombination- Transformation, Transduction and Conjugation. Isolation and cultivation of bacteria. Maintenance of bacterial culture.

UNIT II **(15 hrs)**

VIRUSES: General characters, Classification, Structure, Multiplication. Overview of Phycoviruses and Mycoviruses. Viruses of Eukaryotes – Animal & Plant viruses. Cultivation of viruses – in embryonated egg and in plants. Control of viral infections. Bacteriophages- classification, replication of DNA and RNA phages -Lytic and Lysogenic cycle. Viroids and prions. Mycoplasma: Structure and classification.

UNIT III **(15 hrs)**

FOOD MICROBIOLOGY: Beneficial role of microbes – yoghurt, Bread, Wine & Fermented green tea. Spoilage of fruits, vegetables, meats, poultry, eggs, bakery products, and dairy products. Microbial toxins - Exotoxin, Endotoxin & Mycotoxin. Food Preservation – temperature, drying, radiation and chemicals.

Soil Microbiology: Importance of Microbial flora of soil and factors affecting the microbial community in soil. Interaction among soil microbes (positive and negative interactions) & with higher plants (rhizosphere & phyllosphere). Microorganisms in organic matter decomposition.

Environmental Microbiology: Microbiology of water and air. Water borne diseases - diphtheria, chicken pox. Air borne diseases - Swine flu and Measles. Microbial degradation of chemical pesticides and hydrocarbon.

UNIT IV **(15 hrs)**

IMMUNOLOGY: Introduction, various plant defence mechanisms – structural defences, biochemical defence, hormonal defense, genetic defense, protein and enzymes defences. Role of Secondary metabolites defence (phenolics, flavonoids, tannins). Plant defensive protein – plant lectins, proteinase inhibitors, enzymes, peroxidases, polyphenol oxidases, lypoxygenases. Defense elicitors – insect oral secretion. Role of phytohormones in induced resistance in plants.

UNIT V **(15 hrs)**

PLANT PATHOLOGY: History and significance of plant pathology. Classification of plant diseases, symptomology. Principles of plant infection - Disease triangle. Host parasite interrelationship and interaction. Causal agents of plant diseases - biotic and abiotic causes. Mechanism of penetration - Disease development and dissemination of pathogens. Role of enzymes and toxins in disease development. Defence mechanism of host – structural and biochemical defences. Important diseases of crop plants in India - Sheath blight of rice, Late blight of potato and Little leaf of Brinjal.

Principles of disease management – Cultural practices, physical, chemical and biological methods. Biocontrol - merits and demerits; Plant quarantine and legislation. Integrated Pest Management system. Diagnostic technique to detect pest/pathogen infection - Immunofluorescence (IF).

TEXTBOOKS

1. Dube, H.C. *A text Book of Fungi, Bacteria and Viruses*, 3rd Edition, Agrobios India, ISBN: 8188826383, 2010.
2. Vaman Rao, C. *Immunology*. 2nd Edition. Narosa Publisher, 2006.
3. Kenneth, *M. Janeway's Immunobiology*. 9th Edition. Garland Publisher, 2017.
4. Singh, R.S. *Introduction to Principles of Plant Pathology*, 4th Edition, 2018.
5. Bilgrami, K.S and H.C. Dube. *A text book of Modern Plant Pathology* – Vikas Publishing House (P) Ltd., New Delhi, 2010.
6. Mehrotra, R.S. and Aggarwal, A. *Plant Pathology*. McGraw Hill Publisher, 2017.

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1. Agrios, A.G. *Plant Pathology*, Elsevier. ISBN: 9780120445653, 2007.
2. Jeffery, C., Pommerville. *Alcamos Fundalmedals of Microbiology*. 10th Edition. Johnsand Bartlett Learning, 2014.
3. Pelczar, M. J. *Microbiology*. 35th Edition, Tata-McGraw Hill Publications, New York, ISBN: 0074623260, 2007.
4. Ravi Chandra, N.G. *Fundamentals of Plant Pathology*, Phi Learning, ISBN:812034703X, 2013.
5. Rangasamy, G. *Disease of crop plants in India* (4th edition). Tata Mc Graw Hill New Delhi, 2006.

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1. https://www.wileyindia.com/a-textbook-of-plant-pathology.html
2. https://www.britannica.com/science/plant-disease.
3. https://www.planetatural.com/pest-problem-solver/plant-disease/
4. https://www.elsevier.com/life-sciences/immunology-and-microbiology/books
5. https://www.amazon.in/INTRODUCTION-IMMUNOLOGY-RAFIA-IMRAN-ebook/dp/B09B66SD3J

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - I: CONSERVATION OF NATURAL RESOURCES AND POLICIES (23PBYO12)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To explain the term natural resources.
- To empower the students with concept of ecosystem and energy flow.
- To describe the reasons for degradation of natural resources.
- To list the various endangered species of animals and plants.
- To state the various environmental laws to conserve the natural resources.
- To explain sustainable development and describe the various conventional as well as non-conventional sources of energy.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: define the concept of different natural resources and their utilization
CO2[K2]: describe the utilization land, water, forest and energy resources
CO3[K3]: calculate the management strategies of different natural Resources
CO4[K4]: survey the different national and international efforts in resource management and their conservation
CO5[K5]: assess the various state environmental policy for conservation.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	2	3
CO2[K2]	3	3	2	2	3	2	3
CO3[K3]	3	3	3	3	3	2	2
CO4[K4]	3	3	2	2	3	3	3
CO5[K5]	3	3	3	3	3	3	3
Weightage of the course	15	15	13	13	15	12	14
Weighted percentage of course contribution to Pos	**3.88**	**4.35**	**4.04**	**4.3**	**5.66**	**4.86**	**5.91**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

NATURAL RESOURCES: Definition – Importance – Classification – Human physiological socio-economic and cultural development – Human Population Explosion – Natural Resource Degradation – Concept of conservation – Value system – Equitable resource use for sustainable life system.

UNIT II **(15 hrs)**

FOREST RESOURCES: Forest cover in India and the World – Importance – Desertification – Forest Wealth – Afforestation – Vanasamrakshna Samithi– Agroforestry – Social Forestry – Joint Forest Management Strategy for Forest Conservation. Wild Life: Resources – Importance – Benefits – Wild life Extinction – Causes for Extinction – List of Endanger species in India and in the World – Ecological approach in wild life management – Eco Tourism – Wild Life projects in India – Sanctuaries and National Parks In India – Man and Bio sphere Programme.

UNIT III **(15 hrs)**

LAND AND SOIL RESOURCES: Soil, Complexity of soil nature, regional deposits, Land use and capability classification systems, Land use Planning models and their limitations. Impacts of natural and man-made activities on land characteristics and land use planning– Soil Erosion – Loss of Soil Nutrients – Restoration of Soil Fertility – Soil Conservation Methods and Strategies in India. Wet Land Conservation and Management – Ecological Importance of wet lands in India – Conservation Strategy and ecological Importance. Water Resources: Rivers and Lakes In India – Water Conservation and ground water level increase - Watershed Programme.

UNIT IV **(15 hrs)**

MINERAL RESOURCES: Use and exploitation – Environmental effects of extracting and using mineral resources – Restoration of mining lands – Expansion of supplies by substitution and conservation. Food Resources: World Food Problems – Changes caused by agriculture – overgrazing effects of modern agriculture – Fertilizer-Pesticide problems – Water Logging – Salinity – Sustainable agriculture, life stock breeding and farming.

UNIT V **(15 hrs)**

ENVIRONMENTAL POLICY IN INDIA: Need for policies- Public Policy – Economic policies – Relationship between economic development and environment – Implementing Environmental Public Policy Strategies in pollution control – Constitutional provisions in India regarding environment – Public Awareness and Participation in Environmental Management – National Land Use Policy 1988 – Industrial Policy 1991.

TEXTBOOKS

1. Trivedi R.K. *Environment and Natural Resources Conservation*, 1994.
2. Murthy J.V.S. *Watershed Management in India*, 1994.
3. Raymond, F Dasmann. *Environmental Conservation*, John Wiley, 1984.
4. Nalini, K.S. *Environmental Resources and Management*, Anmol Publishers, New Delhi, 1993.
5. Shyam Divan and Armin Rosencranz. *Environmental Law and Policy in India*, Oxford Uni.Press. 2001.

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1. Haue, R and Freed V.H. *Environmental Dynamics of Pesticides*, Menum Press, London, 1975.
2. Singh, B. *Social Forestry for Rural Development*, Anmol Publishers, New Delhi, 1992.
3. Shafi. R. *Forest Ecosystem of the World*, 1992.
4. Stacy Keach. *Natural Resources Management*. Syrawood Publishing House, 2016.
5. Rathor B.S. *Management of Natural Resource for Sustainable Development*. Daya Publishing House, New Delhi, 2013.

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1. https://www.amazon.in/conservation-natural-resources-Gifford-Pinchot-ebook/dp/B07HX76TVN
2. https://books.google.co.in/books/about/Natural_Resource_Conservation_and_Enviro.html?id=T2SRuhxpUW8C&redir_esc=y
3. https://www.kobo.com/ww/en/ebook/natural-resources-conservation-law
4. https://www.scribd.com/book/552185119/Natural-Resources-Conservation-and-Advances-for-Sustainability
5. https://www.scribd.com/document/354699536/Conservation-of-Natural-Resources

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - I: MUSHROOM CULTIVATION (23PBYO13)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To aware stuents about identification of mushrooms.
- To differentiate the edible mushrooms with toxic and hallucinating fungi.
- To study the cultivation technique of mushrooms
- To learn the economic importance of mushroom in various fields.
- To study how to establish mushroom cultivation as business enterprise.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: describe knowledge on identification of edible and toxic mushrooms
CO2[K2]: identify the nutraceutical properties of edible mushrooms
CO3[K3]: apply the knowledge on cultivation techniques of edible and medicinal mushrooms
CO4[K4]: categorize the harvest and post-harvest techniques of mushroom cultivation
CO5[K5]: discuss the marketing strategies for mushrooms

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	2	3
CO2[K2]	3	3	2	2	3	2	3
CO3[K3]	3	3	3	3	3	2	2
CO4[K4]	3	3	2	2	3	3	3
CO5[K5]	3	3	3	3	3	3	3
Weightage of the course	15	15	13	13	15	12	14
Weighted percentage of course contribution to Pos	**3.88**	**4.35**	**4.04**	**4.3**	**5.66**	**4.86**	**5.91**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

INTRODUCTION: Mushroom, Edible Mushroom, commercial production, medicinal value of mushrooms, nutraceuticals and dietary supplements

UNIT II **(15 hrs)**

MORPHOLOGICAL AND MICROSCOPICAL IDENTIFICATION OF EDIBLE AND POISONOUS MUSHROOMS: Keys for identification of edible mushrooms: Agaricus bisporus, Pleurotus sajorcaju, Volvariella volvcea and Calocybe indica. Key for identifying hallucinogenic mushroom (Psilocybe sp.) Medicinal Mushroom – Cordyceps, Ganoderma lucidum and Lentinus edodes.

UNIT III **(15 hrs)**

CULTIVATION: Substrate sterilization, bed preparation, cropping room and maintenance, raising of pure culture and spawn preparation, factors effecting button mushroom production (Temp, pH, air and water management, competitor moulds and other disease).

UNIT IV **(15 hrs)**

POST-HARVEST MANAGEMENT: Harvest, storage, quality assurance of mushrooms. Pestmanagement.

UNIT V **(15 hrs)**

World production edible mushroom, Legal and regulatory issues of introducing the medicinal mushrooms in different countries. Developing small scale industry and Government schemes. Mushroom Research Centres – International and National levels.

TEXTBOOKS

1. Cheung, P. C.K. *Mushrooms as functional food*. A John Wiley & Sons, Inc., Publication, 2008.
2. Dijksterhuis, J. and Samson, R.A. *Food Mycology: A multifaceted approach in fungiand food*. CRC press, Newyork, 2007.
3. Hall., R.I., Stepheson, S.L., Buchanan, P.K., Yun, W. and Cole, A.L.J. *Edible and poisonous mushrooms of the world*. Timber Press, Portland, Cambridge, 2003.
4. Ting, S. and Miles, P.G. *Mushrooms: Cultivation, nutritional value, medicinal effectand nutritional environmental impact*. CRC press, Newyork, 2004.
5. Verma, *Mushroom: edible and medicinal: cultivation conservation*, strain improvement with their marketing. Daya Publishing House, 2013.

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1. Tiwari., SC., Pandey K. *Mushroom cultivation*. Mittal publisher, New Delhi, 2018.
2. Philips, G., Miles, Chang, S-T. *Mushrooms: Cultivation, nutritional value, medicinal effect and environmental effect*. 2nd ed. CRC Press, 2004.
3. Diego, C.Z., Pando-Gimenez, A. *Edible and medicinal mushrooms: Technology and Application*. Wiley-Blackwell publishers, 2017.
4. Nita Bahl. *Handbook on Mushroom* 4th edition Vijayprimlani for oxford & IBH publishing co., Pvt., Ltd., New Delhi. Dr.C. Sebastian Rajesekaran Reader in Botany Bishop Heber College, Trichy – 17, 2002.
5. Suman. *Mushroom Cultivation Processing and Uses*, M/s. IBD Publishers and Distributors, New Delhi, 2005.

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1. https://www.amazon.in/Mushroom-Cultivation-India-B-C/dp/817035479X
2. http://nrcmushroom.org/book-cultivation-merged.pdf
3. http://agricoop.nic.in/sites/default/files/ICAR_8.pdf
4. http://www.agrimoon.com/mushroom-culture-horticulture-icar-pdf-book/
5. https://books.google.co.in/books/about/Mushroom_Cultivation_in_India.html?id=6AJx99OGTKEC&redir_esc=y

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - I:
PHYTOPHARMACOGNOSY (23PBYO14)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To learn the traditional knowledge on plant derived drugs and their classification.
- To elucidate the biosynthetic pathway of secondary metabolites.
- To study the general pharmacological mode of action of crude drugs of medicinal plants.
- To elucidate the isolation and characterization of plant derived drugs using modern biotechniques.
- To obtain knowledge on pharmacological action of drugs.

Course Outcomes (CO)

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

CO1[K1]: describe traditional knowledge and classification of plant derived drugs
CO2[K2]: examine on biosynthetic pathway of plant metabolites
CO3[K3]: explain the process of development of plant drus
CO4[K4]: analyze various aspects of pharmacological action of herbal drugs
CO5[K5]: evaluate process for development of plant derived drugs.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	2	3
CO2[K2]	3	3	2	2	3	2	3
CO3[K3]	3	3	3	3	3	2	2
CO4[K4]	3	3	2	2	3	3	3
CO5[K5]	3	3	3	3	3	3	3
Weightage of the course	15	15	13	13	15	12	14
Weighted percentage of course contribution to Pos	**3.88**	**4.35**	**4.04**	**4.3**	**5.66**	**4.86**	**5.91**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

General introduction – History and scope of Pharmacognosy including indigenous system of medicine. Various systems of classification of drugs. Pharmacological action of plant drugs. Significance of Pharmacopoeial standards.

UNIT II **(15 hrs)**

MORPHOLOGICAL AND MICROSCOPICAL Biosynthetic pathway of secondary metabolites: Acetate pathway (fatty acids and polyketides), mevalonate and deoxyxylulose phosphate pathway (terpenoids and steroids), shikimate pathway (phenols, amino acids etc.).

UNIT III **(15 hrs)**

Characterization of Therapeutic drugs: Extraction, separation, isolation (Chromatographic techniques) and characterization of secondary metabolites (Spectroscopic techniques). Quality control of plant drugs: Classical and modern approaches of drugs. Significance of Pharmacopoeial standards.

UNIT IV **(15 hrs)**

Pharmacological action of Plant Drugs: Anti-cancer, Bitter tonic, Carminatives and G.I. regulators, Cardiotonics, CNS-Stimulatant, Expectorant, Laxatives, Puragatives. Outline of Pharmacogenomics functions.

UNIT V **(15 hrs)**

Hallucinogenic, allergenic and other toxic plants, poisonous plants - biopesticides -biocides – biofungicides.

TEXTBOOKS

1. Dewick P.M., *Medicinal Natural Products: A biosynthetic approach*, John Wiley &Sons Ltd, 2002.
2. Evans W.C., *Trease and Evan's Pharmacognosy*, W.B. Saunders, 2002.
3. Harborne, J.B., *Phytochemical Methods*, Chapman and Hall, 1998.
4. Vickery M.L. and B. Vickery, *Secondary Plant Metabolism*, The MacMillan PressLtd, 1981.

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1. Bruneton, J. *Pharmacognosy, Phytochemistry, Medicinal Plants*, Intercept Ltd., Paris, 1999.
2. Evans W.C. *Trease and Evan's Pharmacognosy*, W.B. Saunders, 2002.
3. Harborne, J.B. *Phytochemical Methods*, Chapman and Hall, 1998.
4. Vickery M.L and B. Vickery, *Secondary Plant Metabolism*, The MacMillan PressLtd, 1981.
5. Wagner H., S. Bladt and E.M. Zgainski (Translated by A. Scott), *Plant Drug Analysis*,Springer-Verlag, 1984.

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2. https://www.pdfdrive.com/pharmacognosy-books.html
3. https://www.amazon.in/Textbook-Pharmacognosy-Phytochemistry-Kumar-Jayaveera-ebook/dp/B06XKSY76H
4. https://www.amazon.in/Pharmacognosy-Dr-C-K-Kokate-ebook/dp/B07JHNNMWB
5. https://www.amazon.in/EXPERIMENTAL-PHYTOPHARMACOGNOSY-Comprehensive-Guide-Khadabadi-ebook/dp/B07ZFMYQK8

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - II: ALGAL TECHNOLOGY (23PBYO15)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To provide overview of algae cultivation techniques and resource potentials.
- To educate stuents about the widespread uses of commercial algae.
- To educate students about the therapeutic uses of algae.
- To aware students about algal production and utilization.
- To spread awareness of the value of algae and its applications in diverse industries.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: define the applied facet of botany and cultivation methods in algae
CO2[K2]: summarize the commercial potential of algal products
CO3[K3]: estimate emerging areas of algal biotechnology for identifying therapeutic importance of algal products and their uses
CO4[K4]: examine the note of Rdna technology in algae
CO5[K5]: evaluate various algal technologies for the benefit of the ecosystem.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	3	3	3	2	3	3	3
CO3[K3]	3	2	3	2	2	2	3
CO4[K4]	3	3	3	3	3	2	2
CO5[K5]	3	2	3	3	3	2	3
Weightage of the course	15	13	15	13	14	12	13
Weighted percentage of course contribution to POs	**3.88**	**3.79**	**4.66**	**4.33**	**5.3**	**4.88**	**5.51**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

SCOPE OF ALGAL TECHNOLOGY: Scope of algal technology – Commercial potential and utility of algae. Algae as sources for food, feed, pigments, Pharmaceuticals and neutraceuticals, fine chemicals, fuel, biofertilizers and hormones. Economic importance of algae in India.

UNIT II **(15 hrs)**

ALGAL PRODUCTS: Industrial application of algae - fuel, algal lipids - transesterification to ester fuel - substitutes for petroleum derived fuel. Algal products - Spirulina mass cultivation and its applications. Mass cultivation of micro-algae as source of protein and as feed. Liquid seaweed fertilizers - method of preparation, applications and its advantages over inorganic fertilizers.

UNIT III **(15 hrs)**

ALGAL PRODUCTION AND UTILIZATION: Algal production systems; Strain selection; Algal growth curve; Culture media; cultivation methods – small scale and Large-scale cultivation of algae. Harvesting and packing. Therapeutic uses - antioxidant, anti-ulcerogenic, antifungal, antibiotics, antitumor and antiviral compounds. Production of pigments and their utilization.

UNIT IV **(15 hrs)**

IMMOBILIZATION AND RDNA TECHNOLOGY IN ALGAE: Algal immobilization and its applications - culturing for metabolite production and natural compounds. Methods of immobilization - alginate beads-extraction of compounds. Recombinant DNA technology in algae - Transformation systems in algae. Isolation of protoplasts, regeneration of fusion of macro algae. Role of algae in nanobiotechnology.

UNIT V **(15 hrs)**

ROLE OF ALGAE IN ENVIRONMENT MANAGEMENT: Role of algae in environmental health - Sewage treatment, treating industrial effluent, Phytoremediation- heavy metal removal, algae as indicators in assessing water quality and pollution; Saprobic index; Monitoring, assessment, restoration and management of coastal and marine ecosystem environment. Algal culture collection centers in India and abroad and their importance.

TEXTBOOKS

1. Trivedi, P.C. *Algal Biotechnology*. Point publisher, Jaipur. India, 2001.
2. Sahoo, D. *Farming the ocean: seaweed cultivation and utilization*. Aravali International, New Delhi, 2000.
3. Bast, F. *An Illustrated Review on Cultivation and Life History of Agronomically Important Sea plants*. In Seaweed: Mineral Composition, Nutritional and

Antioxidant Benefits and Agricultural Uses, Eds. Vitor Hugo Pomin, 39-70. Nova Publishers, New York. ISBN: 978-1-63117-571-8, 2014.
4. Rapouso, M.F.J., Morais, R.M.S.C., Morais, A.M.M.B. *Bioactivity and applications of sulphated polysaccharides from marine microalgae*. Marine Drugs, 11, 233-252, 2013.
5. Bajpai, Rakesh, K., Prokop, Ales, Zappi, Mark, E. *Algal Biorefineries* Volume1, 2014.

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1. Kumar H.D and H.N. Singh. *A text Book on Algae*. Affiliated East- West Press Pvt. Ltd, 1982.
2. Suganya, T and Renganathan, S. *Biodiesel production using algal technology*. Academic Press. ISBN: 0128009713, 2015.
3. Bajpai, Rakesh K., Prokop, Ales, Zappi, Mark E. *Algal Biorefineries* Volume 1: Cultivation of Cells and Products. Springer. ISBN: 9400774931, 2014.
4. Hojnacka, K., Wieczorek, P.P., Schroeder, G., Michalak, I. (Eds.). *Algae Biomass: Characteristics and Applications*. Developments in Applied Phycology, 2018.
5. Aziz, Farhad and Rasheed, Rezan. *A Course Book of Algae*. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1, 2019.
6. Dinabandhu, S and Kaushik. B.D. *Algal Biotechnology and Environment*. I.K. International, New Delhi, 2012.

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1. https://www.springer.com/gp/book/9783319123332
2. https://www.researchgate.net/publication/318449035_Algae_Biotechnology
3. https://www.energy.gov/sites/prod/files/2015/04/f21/algae_marrone_132100.pdf
4. https://www.amazon.in/Prospects-Challenges-Algal-Biotechnology-Tripathi-ebook/dp/B0779BF366
5. https://www.degruyter.com/view/product/177050
6. https://www.amazon.in/Algal-Biotechnology-Mihir-Kumar-Das/dp/B0072I61LA
7. https://www.elsevier.com/books/algal-biotechnology/ahmad/978-0-323-90476-6

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - II: ETHNOBOTANY, NATUROPATHY AND TRADITIONAL HEALTHCARE (23PBYO16)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the concept of ethnobotany and the life style and traditional practices of plants by Indian tribals.
- To emphasize the importance of non-timber forest products for Indian tribal people livelihoods.
- To evaluate the ethnobotany research techniques to gather tribal knowledge.
- To use strategies for ethno botanical knowledge with value additions.
- To save and document ethno botanicals in order to use plant resources sustainably.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: describe the concept of ethnobotany
CO2[K2]: explain the traditional practices of plants by Indian tribals
CO3[K3]: identify the role of non-timber forest products for livelihood of tribal people in India
CO4[K4]: analyze the ethnobotanical knowledge into value added products
CO5[K5]: evaluate methods to make ethnobotany biopraspecting and value addition.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	3	3	3	2	3	3	3
CO3[K3]	3	2	3	2	2	2	3
CO4[K4]	3	3	3	3	3	2	2
CO5[K5]	3	2	3	3	3	2	3
Weightage of the course	15	13	15	13	14	12	13
Weighted percentage of course contribution to POs	**3.88**	**3.79**	**4.66**	**4.33**	**5.3**	**4.88**	**5.51**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

ETHNOBOTANY: concept, scope, sub disciplines and interdisciplinary of ethno botany. Knowledge of following sociological and anthropological terms: culture, values and norms, institutions, culture diffusion and ethnocentrism. History of ethnobotany: A brief history of ethno botanical studies in the world and in India.

UNIT II **(15 hrs)**

PLANTS USED BY TRIBALS OF INDIA: Distribution of tribes in India. Basic knowledge of following tribes of Tamil Nadu: Irulas, Kanis, Paliyars Badagas, Kurumbres, Thodas and Malayalis. Plants used by tribals of Tamil Nadu.

UNIT III **(15 hrs)**

SOURCES OF ETHNOBOTANICAL DATA: Primary - archeological sources and inventories, Secondary - travelogues, folklore and literary sources, herbaria, medicinal texts and official records. Methods in ethnobotanical research. Prior Informed Consent, PRA techniques, interviews and questionnaire methods, choice of resource persons. Folk taxonomy – plants associated with culture and socio- religious activities. Non – timber forest products (NTFP) and livelihood – Sustainable harvest and value addition.

UNIT IV **(15 hrs)**

NATUROPATHIC MEDICINE: Role of plants in naturopathy- Importance and relevance of medicinal drugs in India. Indian Systems of Medicine (Ayurveda, Siddha, Allopathy, Homeopathy, Unani, Tibetan, Yoga and Naturopathy). Disease diagnosis, treatment, and cure using natural therapies including dietetics, botanical medicine, homeopathy, fasting, exercise, lifestyle counseling, detoxification, and chelation, clinical nutrition, hydrotherapy, naturopathic manipulation, spiritual healing, environmental assessment.

TRADITIONAL HEALTH CARE: Health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being.

UNIT V **(15 hrs)**

BIOPROSPECTING AND VALUE ADDITION: Bioprospecting of drug molecules derived from Indian traditional plants; Methods for bioprospecting of natural resources; From folk Taxonomy to species confirmation - evidences based on phylogenetic and metabolomic analyses; Ethno botanical databases and Traditional knowledge Digital Library (TKDL).

TEXTBOOKS

1. Subramaniam, S.V and V.R. Madhavan (Eds,). *Heritage of the Tamil Siddha Medicine*. International Institute of Tamil Studies. Madras, 1983.
2. Jain, A. and Jain, S.K. *Indian Ethno botany* - Bibliography of 21st Century Scientific Publishers (India), 2016.
3. Gokhale, S.B., Kokate, C.K and Gokhale, A. *Pharmacognosy of Traditional Drugs*. 1st ed. NiraliPrakashan, Pune, 2016.
4. Gringauz. *Introduction to Medicinal Chemistry: How Drugs Act & Why?* Wiley India Pvt Ltd. Noida, 2012.
5. Joshi, S.G. *Medicinal Plants*. Oxford & IBH Publishing C., Pvt., Ltd., New Delhi, 2018.

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1. CSIR. Wealth of India. *A Dictionary of Raw Materials and Industrial Products - Raw Materials*. Vol.1-11. CSIR Publication & Information Directorate. New Delhi, 1940-1976.
2. Gokhale, S.B., Kokate, C.K and Gokhale, A. *Pharmacognosy of Traditional Drugs*. 1st ed. Nirali Prakashan, Pune, 2016.
3. Laird, S.A. *Biodiversity and Traditional knowledge equitable partnerships in Practice.* Earthscan Publications Ltd., London, 2002.
4. Ministry of Environment and Forests. *Ethno biology in India*. A Status Report. All India Coordinated Research Project on Ethno biology. Ministry of Environment and Forests. New Delhi, 1994.
5. Kumar, N. *A Textbook of Pharmacognosy*. Aitbs Publishers, India, 2018.

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1. file:///C:/Users/HP/Downloads/8-Vol.-5-Issue-3-March-2014-IJPSR-1178-A-Paper-81.pdf
2. http://www.plantsjournal.com/archives/2017/vol5issue3/PartB/5-3-8-217.pdf
3. https://shodhganga.inflibnet.ac.in/bitstream/10603/116454/7/07_chapter%201.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - II: HORTICULTURE
(23PBYO17)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To know about the history, divisions, classification and morpology of horticultural plants.
- To acquire knowledge on plant growth processes and stages of plant growth.
- To understand the plant growth environment in relation to soil, nutrients, fertilizers, and bio inoculants.
- To study the sexual and vegetative propagation methods including propagation through specialized vegetative structures.
- To develop practical skills in micro propagation techniques.

Course Outcomes (CO)

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

CO1[K1]: explain various horticultural plants and the conditions that affect their growth and productivity
CO2[K2]: describe various structure and growth process of horticultural plants
CO3[K3]: determine the propagation method, growth, and maintenance of plants in horticulture systems
CO4[K4]: analyze the soil characteristics and fertility for plant growth
CO5[K5]: determine the role plant tissue culture techniques in the production of quality planting stock in horticulture.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	3	3	3	2	3	3	3
CO3[K3]	3	2	3	2	2	2	3
CO4[K4]	3	3	3	3	3	2	2
CO5[K5]	3	2	3	3	3	2	3
Weightage of the course	15	13	15	13	14	12	13
Weighted percentage of course contribution to POs	**3.88**	**3.79**	**4.66**	**4.33**	**5.3**	**4.88**	**5.51**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

INTRODUCTION TO HORTICULTURE: Definition; Brief History, Divisions of Horticulture, Classification of horticultural plants, Structure of Horticultural Plants –Cell and Tissue systems, Anatomy of stem root and leaf, Morphological structures, Plant growth processes-A brief account of Photosynthesis, Respiration, Transpiration and Translocation, Stages of plant growth.

UNIT II **(15 hrs)**

FACTORS AFFECTING PLANT GROWTH: Plant Growth Environment: Abiotic factors, Soil –Profile structure, Primary and Secondary nutrients and their functions, Organic matter, Fertilizers –organic, Inorganic and Potting Media, Bio inoculants, Methods of fertilizer application, Directing Plant growth-Training -Pruning and thinning.

UNIT III **(15 hrs)**

PLANT PROPAGATION: Plant propagation: Seeds –Advantages, Viability, Mechanism of Dormancy and Dormancy Breaking: Methods of Direct and Indirect Seedling Production in Nurseries and Transplantation; Propagation through specialized underground structures –Corm, Tuber, Sucker, Bulb, Bulbil, Rhizome; Vegetative Propagation –Cutting, Layering, Grafting and Budding.

UNIT IV **(15 hrs)**

MICROPROPAGATION TECHNIQUES: Stages, multiplication by shoot tip, Nodal culture and Callus culture-Application and Limitations, Somatic embryogenesis, Synthetic seeds –Preparation and Potential uses of artificial seeds, Embryo Rescue, Soil-less Production of Horticultural crops –Hydroponics, sand culture, gravel culture.

UNIT V **(15 hrs)**

AESTHETICS OF HORTICULTURE: Design: Elements and Principles of Design, Flower Arrangement, Terrarium Culture, Bonsai, Growing Plants Indoors, Turf Production, Landscaping-Principles, Types of Parks, Xeriscaping. Postharvest handling of Horticultural Products –Harvesting, Storage, Processing, Elements of Marketing. Robotics in Horticulture.

TEXTBOOKS

1. Acquaah, G. *Horticulture: Principles and Practices*. (4th ed), Pearson Education, London, UK, 2011.
2. Janik, J. *Horticultural Science*. W.H. Freeman & Company, San Francisco, 1972.
3. Kumar, N. *Introduction to Horticulture*, Rajalakshmi Publication, India, 1994.
4. Manibhushan Rao, K. *Text Book of Horticulture*. (2nd ed), Macmillan India Ltd., New Delhi, 2005.
5. Schilletter, J. C. and Richey, H. W. *Text Book of general Horticulture*. 2nd ed. Biotech Books, Delhi, 2005.

6. Sharma, R.R. *Propagation of horticultural crops*. Kalyani Publishers, New Delhi, 2016.
7. Subba Rao, N.S. *Biofertilizers in Agriculture and Forestry*. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi, 1997.

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1. Acquaah, G. *Horticulture Principles and Practices*. 2nd ed. Pearson Education (Singapore) Pvt. Ltd, 2002.
2. Ashman, M.A. and Puri, G. *Essential soil science-A clear and concise introduction to soil science*. Blackwell scientific publishers, London, 2002.
3. Denisen, E.L. *Principles of Horticulture*. MacMillan Publishing co, Inc. New York, 1979.
4. Dirr, M. and Heuser, C.W. *The Reference Manual of Woody Plant Propagation: From Seed to Tissue Culture*. Timber Press, Oregon, USA, 2009.
5. Thomson, L.M. and Troen, F.R. *Soils and soil fertility Tata*, McGraw Hill Publication Co. Ltd. New Delhi, 1975.
6. Tolanus, S. *Soil fertility*, Fertilizer and Integrated Nutrient management. CBS Publication, Delhi, India, 2006.

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1. https://www.kobo.com/in/en/ebooks/horticulture
2. https://www.gale.com/gardening-and-horticulture
3. https://www.iaritoppers.com/p/horticulture-icar-ecourse-pdf-books.html
4. https://www.amazon.in/Introduction-Horticulture-N-Kumar-ebook/dp/B08M4289M6
5. https://www.researchgate.net/publication/316438576_Polyembryony_in_Horticulture_and_its_significance

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - II: HERBAL TECHNOLOGY (23PBYO18)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 (L-4, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To understand various plants based drugs used in ayurvedha, unani, homeopathy and siddha.
- To explore the value of medical plants.
- To know the pharmacological importance of medicinal plants.
- To enlist phytochemicals, secondary metabolites of market and commercial value.
- To learn preparation of herbal formulation to cure various ailments.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall the importance of herbal technology
CO2[K2]: examine crude drugs from various botanical sources
CO3[K3]: find out the application of secondary metabolites in modern medicine
CO4[K4]: evaluate new drug formulations using therapeutically valuable phytochemical compounds for the healthy life of society
CO5[K5]: justify the current trade status and role of medicinal plants in socio economic growth

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	3	3	3	2	3	3	3
CO3[K3]	3	2	3	2	2	2	3
CO4[K4]	3	3	3	3	3	2	2
CO5[K5]	3	2	3	3	3	2	3
Weightage of the course	15	13	15	13	14	12	13
Weighted percentage of course contribution to POs	**3.88**	**3.79**	**4.66**	**4.33**	**5.3**	**4.88**	**5.51**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

PHARMACOGNOSY: Pharmacognosy scope and importance - source - Crude Drugs – Scope and Importance, Classification (Taxonomical, Morphological Chemical, Pharmacological); Cultivation, Collection and processing of crude drugs. Cultivation and utilization of medicinal and aromatic plants in India.

UNIT II **(15 hrs)**

PLANT TISSUE CULTURE AS SOURCE OF MEDICINES: Plant tissue culture as source of medicines, Role of plant tissue culture in enhancing secondary metabolite production (Withania somnifera, Rauwolfia serpentina, Catheranthus roseus, Andrographis paniculata and Dioscorea sp) - Elicitation - Biotransformation, Hairy root culture. Factors affecting secondary metabolites production. Biogenesis of phytopharmaceuticals.

UNIT III **(15 hrs)**

PLANT PROPAGATION ANALYSIS OF PHYTOCHEMICALS: Methods of Drug evaluation (Morphological, microscopic, physical and chemical). Phytochemical investigations – standardization and quality control of herbal drugs. Preliminary screening, Assay of Drugs - Biological evaluation/assays, Microbiological methods - Chemical Methods of Analysis, Detection of Adulterants: Chemical estimations, Spectrophotometry and fluorescence analysis. Drug adulteration - Types of adulterants.

UNIT IV **(15 hrs)**

GENERAL METHODS OF PHYTOCHEMICAL AND BIOLOGICAL SCREENING: Carbohydrates and derived products: Glycosides - extraction methods (*Digitalis, Dioscorea*); Tannins (Hydrolysable and Condensed types); Volatile oils - extraction methods (Clove, Mentha). Study of some herbal formulation techniques as drug cosmetics.

UNIT V **(15 hrs)**

TYPES OF PHYTOCHEMICALS: Alkaloids - extraction methods (Taxus, Cinchona); Flavonoids- extraction methods, Resins- extraction method: Application of phytochemicals in phytopharmacueticals; Biocides, Biofungicides, Biopesticides. Women entrepreneurship development – marketing cultivated medicinal plants – National Medicinal Plants Board of India.

TEXTBOOKS

1. Kokate, C.K., Purohit, A.P and S.B. Gokhale. *Pharmacognosy*. NiraliPrakashan, 4th Ed. 1996.
2. Roseline, A. 2011. Pharmacognosy. MJP publishers, Chennai, 1996.
3. Tilgner, Sharol Marie. *Herbal ABC's: The Foundation of Herbal Medicine,* 2018.

4. Chichister, U.K.J. *Cultivation and Processing of Medicinal Plants*, Wiley & Sons. Treaseand Evans, 1999.
5. Mukherjee, P.K. *Quality control of herbal drugs*. 3rd edition. Business Horizons Pharmaceutical Publishers, New Delhi, India, 2008.

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1. Wallis, T.E. *Text book of Pharmacognosy*. CBS Publishers and Distributors, New Delhi, 1999.
2. Kumaresan, V and Annie Regland. *Taxonomy of Angiosperms systematic Botany*, Economic Botany, Botany & Ethnobotany, 2004.
3. Anonymous, *Cultivation of Selected Medicinal Plants*. National MedicinalPlants Board, Govt. of India, New Delhi, 2004.
4. Vallabh. *Practical Pharmacognosy*, Kolkata. New Delhi, 2000.
5. Acharya Vipul Rao. *Herbal cure for common diseases*. Diamond books, Pvt. Ltd, 2000.
6. Dey, A.C. *Indian medicinal plants used in Ayurvedic preparations*, Bishen Singh Mahendra Pal Singh, 1998.
7. Sathya, S., Jaiganesh, K.P and Sudha, T. *Current Trends in Herbal Drug Technology*. Pharmacy Council of India New Delhi, 2019.

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1. https://www.kopykitab.com/Herbal-Science
2. https://kadampa.org/books/free-ebook-download-howtotyl?gclid=CjwKCAiA6vXwBRBKEiwAYE7iS5t8yenurClUCTdV9olKo9TbyAh4fsoFqPYWGs5qBTbytD22z7lo0BoCYnUQAvD_BwE
3. https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural-healing/herbal-medicine/_/N-ry0Z8qaZ11iu
4. http://cms.herbalgram.org/heg/volume8/07July/HerbalEBooks.html?t=1310004932&ts= 1579066352&signature=1dd0d5aef818b19bcdcd6c063a78e404
5. https://www.dattanibookagency.com/books-herbs-science.html
6. https://www.springer.com/gp/book/9783540791157

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
SKILL ENHANCEMENT COURSE -I: NURSERY AND GARDENING (23PBYS11)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To recognize the importance of nursery and gardening
- To understand of nursery, gardening and management.
- To develop skills necessary to manage a nursery.
- To acquire knowledge regarding theory and practice of rising plants.
- To develop an interest to become an entrepreneur.

Course Outcomes (CO)

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

CO1[K1]: unerstand the process involved in growing and maintaining plants in nurseries

CO2[K2]: explain different methods of plant propagation and various gardening styles

CO3[K3]: apply techniques for effective hardening of plants and computer applications for creative gardening

CO4[K4]: compare and contrast cultivation of different vegetables and growth of plants in nursery and gardening

CO5[K5]: develop new strategies to enhance growth and quality of nursery plants

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	1	3	2	1	2
CO2[K2]	3	3	2	2	3	3	2
CO3[K3]	2	2	3	3	1	2	1
CO4[K4]	3	3	3	3	3	2	3
CO5[K5]	3	3	2	3	2	3	1
Weightage of the course	14	14	11	14	11	11	9
Weighted percentage of course contribution to POs	**3.62**	**4.08**	**3.42**	**4.67**	**4.17**	**4.47**	**3.81**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

NURSERY: Definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

UNIT II **(9 hrs)**

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

UNIT III **(9 hrs)**

VEGETATIVE PROPAGATION: Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glasshouse.

UNIT IV **(9 hrs)**

GARDENING: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping.

UNIT V **(9 hrs)**

GARDENING OPERATIONS: Soil laying, manuring, watering, management of pests and diseases and harvesting. Sowing/raising of seeds and seedlings: Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.

TEXTBOOKS

1. Bose T.K and Mukherjee, D. *Gardening in India*, Oxford & IBH Publishing Co., New Delhi. 1972.
2. Sandhu, M.K. *Plant Propagation*, Wile Eastern Ltd., Bengaluru. 1989.
3. Kumar, N. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil. 1997.
4. Edmond Musser and Andres. *Fundamentals of Horticulture*, McGraw Hill Book Co., New Delhi. 1957.
5. Agrawal, P.K. *Hand Book of Seed Technology*, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi. 1993.

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1. N.L. Patel, N.L. Chawla, S.L. Ahlawat, T.R. *Commercial Horticulture*||, ASPEE College of Horticulture, Navsari Agricultural University, Navsari 396 450, Gujarat, 2016.

2. Prasad S & Kumar U. *Greenhouse Management for Horticultural Crops*. 2nd Ed. Agrobios. 2005.
3. George Acquaah, *Horticulture-principles and practices*. Prentice-Half of India pvt. Ltd., New Delhi. 2002.
4. Abraham, A and Vatsala, P. *Introduction to Orchids*. Trop. Bot. Garden, Trivandrum. 1981.
5. Hartman, H.T and Kester, D.E. *Plant propagation*. Printice Hall Ltd., New Delhi. 1989.

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1. https://www.kopykitab.com/Nursery-And-Gardening-SEC-by-Prof-C-D-Patil-Dr-G-M-Rane-Dr-S-A-Patil
2. https://www.wonderslate.com/nursery-and-gardening-management/ebook-details?siteName=books&bookId=38078&preview=true
3. https://books.google.co.in/books/about/Nursery_Hindi_Book_Bonsai_Plants_Nursery.html?id=-nfDDwAAQBAJ&redir_esc=y
4. https://www.amazon.in/Gardening-Books/b?ie=UTF8&node=1318122031
5. https://www.worldcat.org/title/handbook-of-horticulture/oclc/688653648

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - IV: PLANT TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY (23PBYC21)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To be familiar with the basic concepts and principles of plant systematics.
- To develop a suitable method for characterization and identification of plants.
- To understand the importance of taxonomic relationships of plant systematics.
- To provide information on various classification systems
- To know about the economic importance of plants.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: explain the basic concepts of morphology of leaves, flowers.
CO2[K3]: describe the taxonomic hierarchy, binomial nomenclature and construct key preparation
CO3[K4]: conclusion the various types of classification, construction of floral formula and floral diagram
CO4[K5]: defend the characteristic features, list out the economic importance of the families and field trip to local botanical garden
CO5[K6]: generalize and explain the characteristic features and list out the economic importance of the families

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	3	3	2	3
CO2[K3]	3	3	2	3	3	3	3
CO3[K4]	3	3	2	3	1	1	2
CO4[K5]	3	2	3	3	2	2	2
CO5[K6]	3	3	2	2	1	3	2
Weightage of the course	15	14	12	14	10	11	12
Weighted percentage of course contribution to POs	**3.88**	**4.08**	**3.73**	**4.67**	**3.79**	**4.47**	**5.08**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

TAXONOMY AND SYSTEMATICS: Botanical exploration and contribution with special reference to India by William Roxburgh, J.D. Hooker, Nathanial Wallich and Gamble, J.S. Principles of classification as proposed – Artificial – Linnaeus, Natural – Bentham and Hooker, Phylogenetic system - Hutchinson, Modern – Takhtajan. Botanical gardens and herbaria of world, preparation and maintenance of Herbarium, Botanical survey of India – its organization and role.

UNIT II **(12 hrs)**

MODERN TRENDS IN TAXONOMY: Modern trends in taxonomy, chemotaxonomy, numerical taxonomy, biosystemics. ICBN uninominal systems-genesis binomial nomenclature, importance and principle. Important articles, typification, principles of priority, effective and valid publication, author citation, recommendations and amendents of code. Glossories and dictionaries, Taxonomic literature (Index Kewensis)

UNIT III **(12 hrs)**

SYSTEMATIC ANALYSIS OF PLANTS-I: Polypetalae – Nympheaceae, Sterculiaceae, Portulaceae, Rhamnaceae, Vitaceae, Sapindaceae, Combretaceae, Turneraceae.

UNIT IV **(12 hrs)**

SYSTEMATIC ANALYSIS OF PLANTS-II: Gamopetalae – Sapotaceae, Oleaceae, Boraginaceae, Scrophulariaceae, Bignoniaceae, Convolvulaceae, Acanthaceae, Verbenaceae.

Monochlamydeae – Nyctaginaceae, Aristolochiaceae, Casuarinaceae. Monocots – Orchidaceae, Amarylidaceae, Lilliaceae, Commelinaceae, Cyperaceae.

UNIT V **(12 hrs)**

ECONOMIC BOTANY: General account on utilization of selected crop plants: (i) Cereals (rice and wheat) – (ii) Pulses (red gram and black gram), (iii) Drug yielding plants (*Withaniasomnifera*and *Coleus aromaticus)* (iv) Oil yielding plants (Groundnut, sunflower). (v) Sugar yielding plants (sugarcane and sugar beet), (vi) Spices and condiments (cardamom, cinnamon). (vii) Timber (Teak and red sanders wood), (viii) Resins and gums (Asafoetida and gum arabic) – (ix) Beverages (tea, coffee), (x) Energy plantation - uses of *Casuarina.*

TEXTBOOKS

1. Pandey, B.P. *Taxonomy of Angiosperms*, S. Chand Publishing, New Delhi, 2013.
2. Sharma, O.P. *Plant Taxonomy*. (II Edition).The McGraw Hill Companies, 2017.
3. Singh, G. *Plant systematics theory and practices*. Oxford and IBH Publishing Co, 2007.

4. Jain, S.K and Rao R.R. *A handbook of field and herbarium methods*. Today and Tomorrow Publ. 1993.
5. Vardhana, R. *Economic Botany*. 1st ed. Sarup Book Publishers Pvt Ltd. New Delhi, 2009.

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1. Wallis, T.E. *Text book of Pharmacognosy*. CBS Publishers and Distributors, New Delhi, 1999.
2. Kumaresan, V and Annie Regland. *Taxonomy of Angiosperms systematic Botany, Economic Botany*, Botany & Ethnobotany, 2004.
3. Anonymous, *Cultivation of Selected Medicinal Plants*. National Medicinal Plants Board, Govt. of India, New Delhi, 2004.
4. Vallabh. *Practical Pharmacognosy*, Kolkata. New Delhi, 2000.
5. Acharya Vipul Rao. *Herbal cure for common diseases*. Diamond books, Pvt. Ltd, 2000.
6. Dey, A.C. *Indian medicinal plants used in Ayurvedic preparations*, Bishen Singh Mahendra Pal Singh, 1998.

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1. https://www.ipni.org/
2. http://www.theplantlist.org/
3. https://www.amazon.in/PLANT-TAXONOMY-Sharma/dp/0070141592
4. https://www.tropicos.org/home

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - V: PLANT ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS
(23PBYC22)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To learn the importance of plant anatomy in plant production systems.
- To classify meristems and identify their structures, functions and roles in monocot and dicot plants growth and secondary growth of woody plants.
- To understand the mechanism for shift from vegetative to reproductive phase.
- To trace the development of male and female gametophyte.
- To understand the recent advances in palynology.

Course Outcomes (CO)

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

CO1[K2]: describe the structures, functions and roles of apical *vs* lateral meristems in monocot and dicot plant growth

CO2[K3]: determine the function and organization of woody stems derived from secondary growth in dicot and monocot plants

CO3[K4]: analyze on sectioning and dissection of plants to demonstrate various stages of plant development

CO4[K5]: conclude the various concepts of plant development and reproduction

CO5[K6]: generalize the process of reproduction in plants with a professional and entrepreneurial mindset

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	3	3	2	2
CO2[K3]	3	1	3	3	3	2	2
CO3[K4]	3	1	3	3	3	3	2
CO4[K5]	3	3	3	1	1	3	3
CO5[K6]	3	3	3	3	3	2	3
Weightage of the course	15	11	15	13	13	12	12
Weighted percentage of course contribution to POs	**3.88**	**3.21**	**4.66**	**4.33**	**4.92**	**4.88**	**5.08**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

CELL WALL: Morphological and physico-chemical changes; Plasmodesmata - growth of cell wall – formation of intercellular spaces; Meristems: Classifications, Theories of shoot and root apices. Vascular Cambium: Composition and organization. Xylem: Primary and secondary xylem – tracheary elements and vessels – vesselless dicots – xylem rays and axial parenchyma of angiosperm wood; Dendrochronology – grain, texture and figure in wood. Phloem: Ultra structure and ontogeny of sieve tube elements and companion cell. Evolution of tracheary elements.

UNIT II **(12 hrs)**

PERIDERM: Structure, organization and activity of phellogen. Polyderm and Rhytiderm – wound periderm. Normal secondary thickening in Dicots; Anomalous secondary growth in Dicots (Amaranthaceae, Aristolochiaceae & Bignoniaceae) and arborescent Monocots. Primary thickening in palms; Ontogeny of leaf, Structure and types of Stomata; Leaf abscission; Major nodal types; Kranz anatomy and its significance. Microtechnique: Principle of killing and fixation, dehydration and rehydration of botanical specimens. Stains: Principle of double staining (fast-green and light green) of free hand sections; Protocol for serial sectioning of paraffin wax impregnated specimens; Mounting and mounting media.

UNIT III **(12 hrs)**

MICROSPORANGIUM AND MALE GAMETOPHYTE: Structure and development of Anther; Ultrastructure and physiology of anther tapetum; Male gametophyte; Palynology: Morphology and ultrastructure of pollen wall, pollen kitt, pollen analysis, pollen storage, pollen sterility and pollen physiology.

UNIT IV **(12 hrs)**

MEGASPORANGIUM AND FEMALE GAMETOPHYTE: Structure and development of Megasporangium; Types of ovules, Endothelium, obturator and nucellus. Megasporogenesis: Female gametophyte: Structure, types, haustorialbehavior and Nutrition of embryo sacs. Fertilization: Double fertilization and triple fusion; Endosperm: Development of endosperm, types, physiological efficiency of endosperm haustoria and functions; Ruminate endosperm. Embryogeny: Development of monocot (Grass) and dicot (Crucifer) embryos.

UNIT V **(12 hrs)**

POLYEMBRYONY: Causes of Polyembryony, classification, induction and practical application. Apomixis and its significance. Seed and Fruit development and role of growth substances. Parthenocarpy and its importance.

TEXTBOOKS

1. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. *The Embryology of Angiosperms* (6th revised and enlarged edition). Vikas Publishing House, New Delhi, 2015.
2. Narayanaswamy, S. *Plant Cell and Tissue Culture*. Tata McGraw Hill Ltd. New Delhi, 1994.
3. Maheshwari, P. *Recent Advances in Embryology of Angiosperms*. Intl. Soc. Plant Morphologists, New Delhi, 1963.
4. Sharma, P.C. *Text Book of Plant Anatomy*. Arjun Publishing House, New Delhi, 2017.
5. Pandey. S.N and Ajanta Chandha. *Plant Anatomy and Embryology*. Vikas Publishinf House Pvt. Ltd, New Delhi, 2006.

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1. Krishnamurthy, K.V. *Methods in Plant Histochemistry*. S. Viswanathan & Co., Madras, 1988.
2. Swamy, B.G.L and Krishnamurthy. K.V. *From flower to fruits*, Tata – McGraw Hill publishing Co Ltd, New Delhi, 1990.
3. Pullaiah, T., Lakshiminarayana, K and Hanumantha Rao, B. *Text book of Embryology of Angiosperms*. Regency Publications, New Delhi, 2006.
4. Crang, R., Lyons-Sobaski, S and Wise, R. *Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants*. Springer International Publishing, 2018.
5. Cutler, D. F., Botha, T and Stevenson, D.W. *Plant Anatomy: An Applied Approach*. Blackwell Publishing, Malden, USA, 2008.
6. Eames, A.J and Mac Daniels, L.H. *Introduction to Plant Anatomy*, 3rd Edition. McGraw-Hill Inc., US, 2013.

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1. https://www.ipni.org/
2. http://www.theplantlist.org/
3. https://faculty.etsu.edu/liuc/plant_anatomy_sites.htm
4. http://aryacollegeludhiana.in/E_BOOK/Botany/plant_anatomy.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - VI: ECOLOGY, PHYTOGEOGRAPHY, CONSERVATION BIOLOGY AND INTELLECTUAL PROPERTY RIGHTS (23PBYC23)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To analyze and comprehend the fundamental ideas of plant ecology.
- To study the plant communities and plant succession stages.
- To be aware of the causes, impacts and control measures of pollution.
- To study biodiversity management and conservation.
- To enhance the knowledge of protecting invaluable components of nature and interactions with the environment.

Course Outcomes (CO)

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

CO1[K2]: summarize the scope and importance of population ecology, plant communities and ecosystemecology

CO2[K3]: experiment the applied aspect of environmental botany

CO3[K4]: analyze the sources, pollution and seek remedies to mitigate and rectify them

CO4[K5]: identify threatened, endangered plant species and create awareness program in protection of biodiversity

CO5[K6]: design the vegetation types, species interaction and their importance and the factors influencing the environmental conditions

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	3	2	2	3
CO2[K3]	3	3	2	3	3	2	3
CO3[K4]	3	2	3	2	2	3	2
CO4[K5]	3	3	2	3	3	2	3
CO5[K6]	3	3	3	3	3	3	2
Weightage of the course	15	14	13	14	13	12	13
Weighted percentage of course contribution to POs	**4.94**	**4.08**	**4.04**	**4.67**	**4.92**	**4.88**	**5.51**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

ECOLOGICAL PRINCIPLES: Introduction – History, scope, concepts. Diversity of plant life; growth form, life form. Basic concepts of population ecology– population dynamics – Regulation of population density. Basics concepts of community – characteristics, composition, structure, origin and development – community dynamics – trends of succession.

UNIT II **(12 hrs)**

ECOSYSTEM ECOLOGY AND RESOURCE ECOLOGY: Introduction – major types – functional aspects of ecosystem: Food chain and food web, energy flow, laws of thermodynamics. Productivity – primary and secondary productivity (GPP & BPP). Resource Ecology: Energy resources; renewable and non-renewable.

Soil: Formation, types and profile - erosion and conservation, Water resources – conservation and management.

Environment Deterioration: Climate change - Greenhouse effect and global warming, ozone depletion and acid rain. Waste management - Solid and e-waste, recycling of wastes. Eco-restoration/remediationecological foot prints - carbon foot print - ecolabeling - environmental auditing.

UNIT III **(12 hrs)**

PHYTOGEOGRAPHY: Phytogeographical Zones - Vegetation types of India and Tamil Nadu, Distribution: Continuous, Discontinuous and Endemism. Theories of discontinuous distribution: Continental drift, Age and area hypothesis. Geographical Information System (GIS) Principles of remote sensing and its applications.

UNIT IV **(12 hrs)**

BIODIVERSITY AND CONSERVATION ECOLOGY: Definition, types of biodiversity – values of biodiversity – Hot spots – Threats to biodiversity: habitat loss. Poaching of wild life – Invasion of exotic species, man and wild life conflicts - endangered and endemic plant species of India, Red list categories of IUCN, Biotechnology assisted plant conservation- in situ and ex situ methods.

UNIT V **(12 hrs)**

INTELLECTUAL PROPERTY RIGHTS: Intellectual Property Rights – Introduction, Kinds of Intellectual Property Rights- Patents, Trademarks, Copyrights, Trade Secrets. Need for intellectual property right, Advantages and Disadvantages of IPR. International Regime Relating to IPR – TRIPS, WIPO, WTO, GATTS. IPR in India genesis and development. Geographical Indication – introduction, types. Patent filing procedure for ordinary application.

TEXTBOOKS

1. Sharma, P.D. *Ecology and Environment*- Rastogi Publication, Meerut, 2017.
2. Pushpa Dahiya and Manisha Ahlawat. *Environmental Science*- A New Approach, Narosa Pub. House, New Delhi.pp.2.1-2.60, 2013.
3. Eugene Odum, *Fundamentals of Ecology* 5th Ed. Cengage, Bengaluru, 2017.
4. Sharma P.D. *Plant ecology and phytogeography*, Rastogi Publications, Meerut, 2019.
5. Neeraj Nachiketa. *Environmental & Ecology A Dynamic approach*. 2nd Edition GKP Access Publishing, 2018.
6. Chandra, A.M and Ghosh, S.K. *Remote sensing and Geographical Information System*, Narosa Publishing House Pvt. Ltd. New Delhi, 2010.

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1. Keddy, P.A. *Plant Ecology: Origins, processes*, *consequences*. 2nd ed. Cambridge, University Press. ISBN. 978-1107114234, 2017.
2. Krishnamurthy, K.V. *An Advanced Text Book of Biodiversity*- Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi, 2004.
3. Ahuja, V.K. *Law relating to Intellectual Property Rights*. India, IN: Lexis Nexis, 2017.
4. Nithyananda, K.V. *Intellectual Property Rights: Protection and Management*. *India*, IN: Cengage Learning India Private Limited, 2019.
5. Venkataraman M. *An introduction to Intellectual property rights*. Create space Independent Pub.North Charleston, USA, 2015.

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1. https://www.intechopen.com/chapters/56171
2. https://plato.stanford.edu/entries/biodiversity/
3. https://sciencing.com/four-types-biodiversity-8714.html.
4. https://www.iaea.org/topics/plant-biodiversity-and-genetic-resources
5. http://www.bsienvis.nic.in/Database/Status_of_Plant_Diversity_in_India_17566.aspx
6. https://www.youtube.com/watch?v=qtTLiQoYTyQ
7. https://www.youtube.com/watch?v=208B6BtX0Ps
8. https://www.youtube.com/watch?v=6p1TpVJYTds
9. https://www.amazon.in/Intellectual-Property-Rights-Vijay-Durafe-ebook/dp/B08N4VRQ86

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - VII: PRACTICAL: TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY AND PLANT ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS AND ECOLOGY, PHYTOGEOGRAPHY, CONSERVATION BIOLOGY AND INTELLECTUAL PROPERTY RIGHTS (23PBYC2P)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To understand and develop skill sets in plant morphological, floral characteristics and artificial key preparation.
- To carry out research in frontier areas of plant science.
- To classify meristems and identify their structures, functions and roles in monocot and dicot plants growth and secondary growth of woody plants
- To learn the importance of plant anatomy in plant production systems.
- To know about different vegetation sampling methods.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: explain the recent advances in morphological and floral characteristics
CO2[K3]: identify different floral characteristics and artificial key preparation for plant identification
CO3[K4]: analyze the advanced in relation with plant anatomy and embryology
CO4[K5]: assess their idea on sectioning and dissection of plants to demonstrate various stages of plant development
CO5[K6]: create about different vegetation sampling methods

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	3	3	2	3
CO2[K3]	3	3	2	3	3	3	3
CO3[K4]	3	3	3	3	3	3	3
CO4[K5]	3	3	3	3	3	3	3
CO5[K6]	3	2	2	3	3	3	2
Weightage of the course	15	14	13	15	15	14	14
Weighted percentage of course contribution to POs	**3.88**	**4.08**	**4.04**	**5**	**5.68**	**5.69**	**5.93**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

TAXONOMY AND ECONOMIC BOTANY OF ANGIOSPERMS: Preparation of artificial keys. Description of a species, based on virtual herbarium and live specimens of the families mentioned in the theory. Study the products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family. Solving nomenclature problems.

Field trip: A field trip at least 3-4 days to a floristically rich area to study plants in nature and field report submission of not less than 20 herbarium sheets representing the families studied.

UNIT II **(15 hrs)**

ANATOMY

1. Study of shoot apex of *Hydrilla*
2. Observation of cambial types.
3. Sectioning and observation of nodal types.
4. Study of anomalous secondary growth of the following:

STEM- *Nyctanthus, Bouerhhavia,* and *Mirabilis*.

ROOT: *Acyranthus*

5. Observation of stomatal types by epidermal peeling.
6. Double staining technique to study the stem anomali.

UNIT III **(15 hrs)**

EMBRYOLOGY

1. Observation of T.S. of anther.
2. Observation of ovule types.
3. Observation of mature embryo sacs.
4. Dissection and observation of embryos (globular and cordate embryos).
5. Study of pollen morphology
6. Study of in vitro pollen germination.
7. Observation of endosperm types.

UNIT IV **(15 hrs)**

ECOLOGY

1. Determination of the quantitative characters of a plant community by random quadrat method (abundance, density, dominance, species diversity, frequency) in grazing land, forests.
2. Estimation of above ground and below ground biomass in a grazing land employing minimum size of quadrat.
3. To determine soil moisture, porosity and water holding capacity of soil collected from varying depth at different locations.
4. Determination of pH of soil and water by universal indicator (or) pH meter.
5. Determination of dissolved oxygen.

6. Estimation of carbonate.
7. Estimation of bicarbonate.

UNIT V **(15 hrs)**

PHYTOGEOGRAPHY, CONSERVATION BIOLOGY & INTELLECTUAL PROPERTY RIGHTS

1. Mapping of world vegetation
2. Mapping of Indian vegetation.
3. Remote sensing – Analyzing and interpretation of Satellite photographs-Vegetation/ weather.
4. Visit to remote sensing laboratory (at Anna University, Regional Meteorological Centre at Numgambakkam).

TEXTBOOKS

1. Subramaniam, N.S. *Laboratory Manual of Plant Taxonomy*. Vikas Publishing House Pvt. Ltd., New Delhi, 1996.
2. Cutler, D.F., Botha, C.E.J., Stevenson, D.W., and William, D. *Plant anatomy: an applied approach* (No. QK641 C87). Oxford: Blackwell, UK, 2008.
3. Sundara, R. S. *Practical manual of plant anatomy and embryology*. Anmol Publ. PVT LTD, New Delhi, 2000.
4. Sharma, H.P. *Plant Embryology: Classical and Experimental*, Bombay Popular Prakashan, ISBN-8173199698, 9788173199691, 2009.
5. Sharma P.D. Plant ecology and phytogeography, Rastogi Publications, Meerut, 2019.

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1. Aler Gingauz. *Medicinal Chemistry*. Oxford University Press & Wiley Publications, 2001.
2. Mann J. Davidson, R.S and J.B. Hobbs, D.V. Banthorpe, J.B. Harborne. *Natural Products*. Longman Scientific and Technical Essex, 1994.
3. Gopalan, C., B.V. Ramasastri and S.C. Balasubramanian. *Nutritive Value of Indian Foods*. National Institute of Nutrition, Hyderabad, 1985.
4. Harborne. J.B. *Phytochemical methods*. A guide to modern techniques of Plant Analysis, Chapman and Hall publication, London, 1998.
5. Sundara Rajan, S, *Practical Manual of Plant Anatomy and Embryology* 1st ed, Anmol Publications, ISBN-812610668, 2003.
6. Katherine Esau. *Anatomy of Seed Plants*. 2nd edition, John Wiley and Sons, 2006.

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1. https://www.kobo.com/gr/en/ebook/phytochemistry-2
2. https://www.amazon.in/Textbook-Pharmacognosy-Phytochemistry-Kumar-Jayaveera-ebook/dp/B06XKSY76H

3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ
4. https://studyfrnd.com/pharmacognosy-and-phytochemistry-book/
5. https://www.worldcat.org/title/textbook-of-pharmacognosy-and-phytochemistry/oclc/802053616
6. https://www.worldcat.org/title/phytochemistry/oclc/621430002

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - III: MEDICINAL BOTANY (23PBYO21)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the uses and effects of medicinal plants.
- To gain knowledge about the historical and modern uses of plants in medicine.
- To gain insights into the perspectives of ethnobotanical research.
- To know the methods of harvesting, drying and storage of medicinal herbs.
- To create new strategies for growth and quality check of medicinal herbs.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recognize plants and relate to their medicinal uses
CO2[K2]: explain about the phytochemistry, pharmacognosy and bioprospecting of medicinal plant extracts
CO3[K3]: apply techniques for conservation and propagation of drugs plants
CO4[K4]: analyze and decipher the significance of various methods of harvesting, drying and storage of medicinal herbs
CO5[K5]: assess new strategies to enhance growth and quality check of medicinal herbs considering the practical issues pertinent to India

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	3
CO2[K2]	3	2	3	3	3	2	3
CO3[K3]	3	2	3	3	3	3	3
CO4[K4]	3	2	2	3	3	2	2
CO5[K5]	3	2	2	3	3	3	3
Weightage of the course	15	11	13	15	15	13	12
Weighted percentage of course contribution to POs	**3.88**	**3.23**	**4.04**	**4.97**	**5.62**	**5.26**	**5.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

HISTORY AND TRADITIONAL SYSTEMS OF MEDICINE: Historical Perspectives – European, African, American, Southeast Asian Practices. Scope and Importance of Medicinal Plants; Traditional systems of medicine - Definition and Scope. Classical health traditions - Naturopathy, Siddha, Ayurveda, Homeopathy, Unani and MateriaMedica. Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in Ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e-tabiya, tumors treatments/ therapy, polyherbal formulations.

UNIT II **(9 hrs)**

PHYTOCHEMISTRY AND PHARMACOGNOSY: Phytochemistry, important phytoconstituents, their plant sources, medicinal properties. Histochemistry – definition, principles, staining methods. Biological stains – bright field dyes and flurochromes, detection and localization of phytochemicals. Raw drugs, authenticity, study through physical, microscopic and analytical methods. Different types of formulations. Adulteration and Admixtures.

UNIT III **(9 hrs)**

ACTIVE PRINCIPLE & DRUG DISCOVERY: Brief description of selected plants, Active principles, biochemical properties and medicinal uses of Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia*for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardio protection, turmeric (*Curcuma longa*) for wound healing, antioxidant and anticancer properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, *Salix* for analgesic, *Cinchona* and *Artemisia* for Malaria, *Rauwolfia*as tranquilizer, *Belladona* as anticholinergic, *Digitalis* as cardiotonic, *Podophyllum* as antitumor, *Stevia rebaudiana* for antidiabetic, *Catharanthus roseus* for anticancer. Bioprospecting, drug discovery from plants with reference to diabetes and cancer. Product development and quality control.

UNIT IV **(9 hrs)**

CONSERVATION AND AUGMENTATION: Significance of Cultivation, management, policies for conservation and sustainable use of medicinal plants. Conservation of endemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethno medicinal plant Gardens. Propagation of Medicinal Plants: seeds, cuttings, layering, grafting and budding.

UNIT V **(9 hrs)**

ETHNO BOTANY AND FOLK MEDICINE: Concepts and definition of Ethno botany and folk medicines. A brief history of ethnobotanical studies – globally &

locally. Methods to study ethno botany; Applications of Ethno botany: Folk medicines of ethno botany, ethno medicine, ethno ecology, ethnic communities of India. Understanding the traditions of tribes in Tamil Nadu – Irulas and Kanis. Repository of Ethnobotanical data – Archeology, inventories, folklore and literature. Traditional Knowledge Sharing - Prior information consent, interviews, questionnaires and knowledge partners.Plants associated with culture, social, religious and medicinal purposes.Commercial use of traditional knowledge – ethics, IPR, biopiracy, equitable benefit sharing models.

TEXTBOOKS

1. AYUSH (www.indianmedicine.nic.in). *About the systems—An overview of Ayurveda*, *Yoga and Naturopathy*, *Unani*, *Siddha and Homeopathy.* New Delhi: Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India, 2014.
2. Bhat, S.V., Nagasampagi, B.A., & Meenakshi, S. *Natural Products – Chemistry and Applications*. Narosa Publishing House, India Ltd, 2009.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow. *AushGyanya*: Handbook of Medicinal and Aromatic Plant Cultivation, 2016.
4. Kapoor, L. D. *Handbook of Ayurvedic medicinal plants.* Boca Raton, FL: CRC Press, 2001.
5. Saroya, A.S. *Ethno botany*. ICAR publication, 2017.
6. Thakur, R. S., H. S. Puri, and Husain, A. *Major medicinal plants of India*. Central Institute of Medicinal and Aromatic Plants, Lucknow, India, 1989.

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1. Akerele, O., Heywood, V and Synge, H. *The Conservation of Medicinal Plants*. Cambridge University Press, 1991.
2. Evans, W.C. *Trease and Evans Pharmacognosy*, 16th edn. Philadelphia, PA: Elsevier Saunders Ltd, 2009.
3. Jain, S.K. and Jain, Vartika. (eds.). *Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects*. Deep Publications, Delhi, 2017.
4. Amruth. *The Medicinal plants Magazine* (All volumes) Medicinal plant Conservatory Society, Bangalore, 1996.
5. Bhattacharjee, S.K. *Hand Book of Medicinal plants*. Pointer Publishers, Jaipur, 2004.
6. Handa, S.S and V.K. Kapoor. *Pharmacognosy*. VallabhPrakashan, New Delhi, 1993.

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1. https://www.amazon.in/Medical-Botany-Plants-Affecting-Health/dp/0471628824
2. https://www.amazon.in/Current-Trends-Medicinal-Botany-Muhammad/dp/9382332502
3. https://link.springer.com/book/10.1007/978-3-030-74779-4
4. https://www.elsevier.com/books/medicinal-plants/da/978-0-08-100085-4

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - III: PHYTOCHEMISTRY
(23PBYO22)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To comprehend the various classes of phytochemicals from plant kingdom.
- To understand the biosynthetic processes and their structural and functional characteristics.
- To learn about the isolation of different phytochemicals using techniques.
- To learn about the application of different phytochemicals to cure diseases in human and animals.
- To understand the information of the traditional system of medicine.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: describe the role of plants in the survival of human beings
CO2[K2]: exploration of plant knowledge to alleviate common diseases and development of systems of medicine
CO3[K3]: build knowledge on different classes of phytochemicals present in higher and lower plants species
CO4[K4]: categorize the extraction and isolation of secondary metabolites
CO5[K5]: evaluate the methods of screening of secondary metabolites for various biological properties

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	3
CO2[K2]	3	2	3	3	3	2	3
CO3[K3]	3	2	3	3	3	3	3
CO4[K4]	3	2	2	3	3	2	2
CO5[K5]	3	2	2	3	3	3	3
Weightage of the course	15	11	13	15	15	13	12
Weighted percentage of course contribution to POs	**3.88**	**3.23**	**4.04**	**4.97**	**5.62**	**5.26**	**5.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

SECONDARY METABOLITES AND CLASSIFICATION: Phytochemistry: Definition, history, principles. Secondary metabolites: definition, classification, occurrence and distribution in plants, functions, chemical constituents. Alkaloids, terpenoids, flavonoids, steroids, and coumarins.

UNIT II **(9 hrs)**

ISOLATION AND QUANTIFICATION OF PHYTOCHEMICALS: Techniques for isolation of medicinally important biomolecules: solvent extraction, chemical separations, steam distillation, soxhlet extraction. Purification, concentration, determination and quantification of compounds (TLC, Column, HPLC). Characterization of phytochemicals: spectroscopic methods.

UNIT III **(9 hrs)**

BIOSYNTHETIC PATHWAYS AND APPLICATION OF PHYTOCHEMICALS: Biosynthetic pathways of secondary compounds: Shikimic pathway; Mevalonic Acid Pathway; Pathways for commercially important phytochemicals: Taxol and *Vinca* alkaloids. Applications of phytochemicals in medicine, pharmaceuticals, food, flavour and cosmetic industries.

UNIT IV **(9 hrs)**

HERBALISM AND ETHNOBOTANY: Herbs and healing: Historical perspectives: local, national and global level; Herbal cultures: origin and development of human civilizations; Ethnobotany and Ethno medicine; Development of European, South and Central American, African, Indian, Chinese, and South East Asian Herbal Cultures.

UNIT V **(9 hrs)**

TRADITIONAL SYSTEM OF MEDICINE: Classical health traditions: Systems of medicine: origin and development of biomedicine; Indian Systems of Medicine (Ayurveda, Siddha, Unani, Tibetan, Yoga and Naturopathy) Ayurveda: Historical perspective, *Athuravritta* (disease management and treatment which involves eight specialties including Internal medicine and surgery); Fundamental principles of Ayurveda: Panchabhootha theory, Thridosha theory, Saptadhatu theory and *Mala* theory; Ayurvedic Pharmacology Ayurvedic Pharmacopoeia; *Vrikshayurveda.*

TEXTBOOKS

1. Kokate, C.K., Purohit, A.P and Gokhale, S.B. *Pharmacognosy*. Vol. I & II. NiraliPrakashan, Pune, 2010.
2. Mohamed Ali. *Textbook of Pharmacognosy*. CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2012.

3. Gokhale, S.B., Kokate, C.K. and Gokhale, A. *Pharmacognosy of Traditional Drugs*. NiraliPrakashan, 1st Edition. ISBN: 9351642062. 2, 2016.
4. Joshi, S.G. *Medicinal Plants*. Oxford & IBH Publishing C., Pvt., Ltd., New Delhi, 2018.
5. Kumar, N. *A Textbook of Pharmacognosy*. Aitbs Publishers, India, 2018.

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1. Shah, B.N. *Textbook of Pharmacognosy and phytochemistry*. Cbs Publishers & Distributors, New Delhi, 2005.
2. Harshal A and Pawar. *Practical book of pharmacognosy and phytochemistry*-Everest Publishing house, 2018.
3. Varsha Tiwari and Shamim Ahmad. *A practical book of pharmacognosy and phytochemistry*. Nirali prakashan advancement of knowledge, 2018.
4. Braithwaite, A and F.J. Smith. *Chromatographic Methods* (5th Edition) Blackie Academic & Professional London, 1996.
5. Wilson, K and J. Walker (Eds). *Principles and Techniques of Practical Biochemistry*(4thEdition) Cambridge University Press, Cambridge, 1994.
6. Harborne. J.B. *Phytochemical methods*. A guide to modern techniques of Plant Analysis,Chapman and Hall publication, London, 1998.

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1. https://www.kobo.com/gr/en/ebook/phytochemistry-2
2. https://www.amazon.in/Textbook-Pharmacognosy-Phytochemistry-Kumar-Jayaveera-ebook/dp/B06XKSY76H
3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ
4. https://studyfrnd.com/pharmacognosy-and-phytochemistry-book/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - III: RESEARCH METHODOLOGY, COMPUTER APPLICATIONS AND BIOINFORMATICS
(23PBYO23)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To equip students to collect, analyze and evaluate data generated by their own inquiries in a scientific manner.
- To provide knowledge to students for instantly commence research careers and/or start entrepreneurial ventures.
- To develop interdisciplinary skills for learn about the biological database.
- To students aware the recent technologies for sequencing and bioinformatics analysis and is able to the structural and functional genomics of plants.
- To operate various software resources with advanced functions.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recognize the need of centrifuges and chromatography
CO2[K2]: represent the principles and applications of electrophoresis
CO3[K3]: construct the phylogenetic trees for similar characteristic feature of plant genomes and *de novo* drug design through synthetic biology
CO4[K4]: comment the concept of pairwise alignment of DNA sequences
CO5[K5]: criticize the features of local and multiple alignments

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	3
CO2[K2]	3	2	3	3	3	2	3
CO3[K3]	3	2	3	3	3	3	3
CO4[K4]	3	2	2	3	3	2	2
CO5[K5]	3	2	2	3	3	3	3
Weightage of the course	15	11	13	15	15	13	12
Weighted percentage of course contribution to POs	**3.88**	**3.23**	**4.04**	**4.97**	**5.62**	**5.26**	**5.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

Literature collection and citation: bibliography —bibliometrics (scientometrics): definition-laws — citations and bibliography - *biblioscape— plagiarism— project proposal writing — dissertation writing – paper presentation (oral/poster) - E-learning tools- monograph — introduction and writing-Standard operating procedure (SOP) – introduction and preparation — Research Institutions - National and International.

UNIT II **(9 hrs)**

Basic principles and applications of pH meter, UV-visible spectrophotometer, centrifuge, lyophilizer, chromatography- TLC, Gas chromatography with mass spectrum (GC/MS), and HPLC-Scanning electron microscopy-Agarose gel Electrophoresis — Polyacrylamide Gel Electrophoresis – Polymerase chain reaction

UNIT III **(9 hrs)**

Introduction to computers and Bioinformatics. Types of hardware and software operating systems. Fundamentals of networking, operation of networks, telnet, ftp, www, Internet. Biological Research on the web: Using search engines, finding scientific articles.

UNIT IV **(9 hrs)**

Public biological databases, searching biological databases. Use of nucleic acid and protein data banks.

UNIT V **(9 hrs)**

NCBI, EMBL, DDBJ, SWISSPORT, Protein prediction and Gene finding tools. Techniques in Bioinformatics- BLAST, FASTA, Multiple Sequence Analysis **.**

TEXTBOOKS

1. Veerakumari, L. *Bioinstrumentation*. MJP Publisher, India. p578, 2017.
2. SreeRamulu, V.S. *Thesis Writin*g, Oxford& IBH Pub. New Delhi, 1988.
3. Kothekar, V and T.Nandi. *An introduction to Bioinformatics*. Panima publishing crop, New Delhi, 2009.
4. Mani, K and N. Vijayaraj. *Bioinformatics – A Practical Approach*.1st Edn. Aparna publication, Coimbatore, 2004.
5. Gurumani, N. *Research Methodology*: For Biological Sciences, MP. Publishers, 2019.

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1. Jayaraman, J. *Laboratory manual of Biochemistry*, Wiley Eastern Limited, New Delhi 110 002, 2000.

2. Pevsner, J. *Bioinformatics and functional genomics*. Hoboken,NJ:Wiley-Blackwell, 2015.
3. Arthur Conklin W.M and Greg White, *Principles of computer security*. TMH. McGraw-Hill Education; 4 edition, 2016.
4. Irfan Ali Khan and Attiya Khanum (eds.). *Introductory Bioinformatics*. Ukaaz Publications, Hyderabad, 2004.
5. Arthur Conklin W.M., and Greg White. *Principles of computer security*. TMH., McGraw-Hill Education; 4th edition, 2016.

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1. https://www.kobo.com/in/en/ebook/bioinstrumentation-1
2. https://www.worldcat.org/title/bioinstrumentation/oclc/74848857
3. https://www.amazon.in/Bioinstrumentation-M-H-Fulekar-Bhawana-Pandey-ebook/dp/B01JP3M9TW
4. https://en.wikipdia.org/wiki/bioinstrumentation
5. https://www.britannica.com/science/chromatography
6. https://en.wikipedia.org/wiki/electrophoresis

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - III: BIOPESTICIDE TECHNOLOGY (23PBYO24)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the value and applications of biopesticides.
- To comprehend the various issues related to the use of chemical pesticides in horticulture, forestry, and agriculture.
- To gain knowledge about several biopesticides (bio-insecticides, bio-fungicides, bio-bactericides, bio-nematicides and bio-herbicides).
- To gain knowledge of techniques for mass production of biopesticides.
- To aware the application strategies for weeds, nematodes, and disease.

Course Outcomes (CO)

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

CO1[K1]: define the issues in use of chemical pesticides and their harmful effects on life

CO2[K2]: outline the significance of biopesticides and their beneficial role in controlling insect pests, diseases, nematodes and weeds

CO3[K3]: find on identification of promising biopesticides and their mechanisms of action against insect pests, nematodes and weeds

CO4[K4]: analyze the mass production and technology of biopesticides

CO5[K5]: assess the importance of biopesticides product for commercialization

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	3
CO2[K2]	3	2	3	3	3	2	3
CO3[K3]	3	2	3	3	3	3	3
CO4[K4]	3	2	2	3	3	2	2
CO5[K5]	3	2	2	3	3	3	3
Weightage of the course	15	11	13	15	15	13	12
Weighted percentage of course contribution to POs	**3.88**	**3.23**	**4.04**	**4.97**	**5.62**	**5.26**	**5.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

INTRODUCTION: Introduction of biopesticides. Biological control, History and concept of biopesticides. Importance, scope and potential of biopesticide. Advantages for the use of biopesticides.

UNIT II **(9 hrs)**

TYPES OF BIOPESTICIDES: Classification of biopesticides, botanical pesticides and biorationales. Mass production technology of bio-pesticides. Major classes-Properties and uses of Bioinsecticides, biofungicides, biobactericides, bionematicides and bioherbicides. Importance of neem in organic agriculture.

UNIT III **(9 hrs)**

IMPORTANT BIOINSECTICIDES: *Bacillus thuringiensis*, NPV, entomopathogenic fungi (*Beauveria, Metarhizium, Verticillium, Paecilomyces*). Biofungicides: *Trichoderma, Gliocladium,* non-pathogenic *Fusarium, Pseudomonas* spp., *Bacillus* spp. Biobactericides: *Agro bacterium radiobacter*. Bionematicides: *Paecilomyces*, *Trichoderma*, Bioherbicides: *Phytophthora, Colletotrichum*.

UNIT IV **(9 hrs)**

STANDARDIZATION OF BIOPESTICIDES: Target pests and crops of important biopesticides and their mechanisms of action. Testing of quality parameters and standardization of biopesticides.

UNIT V **(9 hrs)**

FORMULATION: Mass multiplication and formulation technology of biopesticides. Prospects and problems in commercialization and efficiacy of biopesticides. Commercial products of biopesticides.

TEXTBOOKS

1. Johri, J. *Recent Advances in Biopesticides: Biotechnological Applications*. New IndiaPublishing Agency (NIPA), New Delhi, 2020.
2. Kaushik, N. *Biopesticides for sustainable agriculture: prospects and constraints*. TERIPress, New Delhi, 2004.
3. Sahayaraj, K. *Basic and Applied Aspects of Biopesticides*. Springer India, NewDelhi, 2014.
4. Tebeest, D.O. *Microbial Control of Weeds*. CBS Publishers and Distributors, New Delhi, 2020.
5. Joshi, S.R. *Biopesticides: A Biotechnological Approach*. New Age International (P) ltd. New Delhi, 2020.

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1. Ainsworth, G.C. *A Dictionary of the Fungi*. Commonwealth Mycological

Institute, Kew, Surrey, England, 1971.
2. Carlile, M.J., Watkinson, S.C and Gooday, G.W. *The Fungi*. 2nd Edition. Academic Press, San Diego, 2001.
3. Manoj Parihar, Anand Kumar. *Biopesticides*. Volume 2: Advances in Bio-inoculants. Elsevier, 2021.
4. Bailey, A., Chandler, D., Grant, W. P., Greaves, J., Prince, G., Tatchell, M. *Biopesticides: pest management and regulation*. Plumx, 2010.
5. Manoharachary, C., Singh, H.B., Varma, A. *Trichoderma: Agricultural Applications and Beyond*. Springer International Publishing, New York, USA, 2020.
6. Nollet, L.M.L and Rathore, H.S. *Biopesticides Handbook*. CRC Press, Florida, USA, 2019.
7. Anwer, M.A. *Biopesticides and Bioagents*: *Novel Tools for Pest Management*. Apple Academic Press, Florida, USA, 2021.

Web Sources

1. https://www.kobo.com/gr/en/ebook/phytochemistry-2
2. https://www.amazon.in/Textbook-Pharmacognosy-Phytochemistry-Kumar-Jayaveera-ebook/dp/B06XKSY76H
3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ
4. https://studyfrnd.com/pharmacognosy-and-phytochemistry-book/
5. https://www.worldcat.org/title/textbook-of-pharmacognosy-and-phytochemistry/oclc/802053616
6. https://www.worldcat.org/title/phytochemistry/oclc/621430002

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - IV: APPLIED BIOINFORMATICS (23PBYO25)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.
- To explain the essential features of the interdisciplinary field of science for better understanding biological data.
- To outline the types of biological databases.
- To demonstrate different online bioinformatics tools.
- To summarize the strong foundation for performing further research in bioinformatics.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: list of the tools for DNA sequence analysis
CO2[K2]: explain and application of bioinformatics
CO3[K3]: experiment aspects of protein-protein interaction, BLAST and PSI-BLAST
CO4[K4]: examine the features of local and multiple alignments
CO5[K5]: criticize the characteristics of phylogenetic methods and bioinformatics applications

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	2	3	3	3	3	2	2
CO3[K3]	3	3	3	3	3	2	3
CO4[K4]	3	3	3	3	3	3	3
CO5[K5]	3	2	2	2	3	3	3
Weightage of the course	14	14	14	14	15	13	13
Weighted percentage of course contribution to POs	**3.63**	**4.12**	**4.36**	**4.64**	**5.62**	**5.24**	**5.46**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

BIOINFORMATICS AND INTERNET: Internet Basics - File Transfer Protocol - The World Wide Web - Internet Resources –databases – types-Applications - NCBI Data Model - SEQ-Ids – Biosequences-Biosequence sets – Sequence annotation – Sequence description.

UNIT II **(9 hrs)**

GENBANK SEQUENCE DATABASE: Introduction- Primary And Secondary Databases - Format Vs. Content - Genbank Flatfile- Submitting DNA Sequences to the Databases - DNA/RNA - Population, Phylogenetic, and Mutation Studies - Protein-Only Submissions - Consequences of DNA Model - EST/STS/GSS/HTG/SNP and Genome Centers - Contact points for submission of sequence data to DBJ/EMBL/Genbank.

UNIT III **(9 hrs)**

STRUCTURE DATABASES: Introduction to Structures - Protein Data Bank (PDB) - Molecular Modeling Database at NCBI Structure File Formats - Visualizing Structural Information - Database Structure Viewers - Advanced Structure Modeling - Structure Similarity Searching.

UNIT IV **(9 hrs)**

SEQUENCE ALIGNMENT AND DATABASE SEARCHING: Introduction - Evolutionary Basis of SequenceAlignment - Modular Nature of Proteins - Optimal Alignment Methods - Substitution Scores and Gap Penalties- Database Similarity Searching - FASTA – BLAST (BlastP, BlastN, etc.,) - Position Specific Scoring Matrices, Spliced Alignments.

UNIT V **(9 hrs)**

PREDICTIVE METHODS: Using Protein Sequences Protein Identity Based on Composition - Physical Properties Based on Sequence - Motifs and Patterns - Secondary Structure and Folding Classes - Specialized Structures or Features - Tertiary Structure.

TEXTBOOKS

1. Baxevanis, A. D. & Ouellette, B. F. *Bioinformatics: A practical guide to the analysis ofgenes and proteins*. New York: Wiley-Interscience, 2001.
2. Bourne, P. E., & Gu, J. *Structural bioinformatics*. Hoboken, NJ: Wiley-Liss, 2009.
3. Lesk, A. M. *Introduction to bioinformatics*. Oxford: Oxford University Press, 2002.
4. Mount, D. W. *Bioinformatics: Sequence and genome analysis*. Cold Spring Harbor, NY:Cold Spring Harbor Laboratory Press, 2001.
5. Pevsner, J. *Bioinformatics and functional genomics*. Hoboken, NJ: Wiley-Blackwell, 2015.

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1. Campbell, A.M and Heyer, L.J. *Discovering genomics, proteomics, and bioinformatics*. San Francisco: Benjamin Cummings, 2003.
2. Green, M.R and Sambrook, J. *Molecular cloning: A laboratory manual*. Cold SpringHarbor, NY: Cold Spring Harbor Laboratory Press, 2012.
3. Liebler, D.C. Introduction to proteomics: Tools for the new biology. Totowa, NJ: HumanaPress, 2002.
4. Old, R.W., Primrose, S.B., and Twyman, R.M. *Principles of gene manipulation: An introduction to genetic engineering*. Oxford: Blackwell Scientific Publications, 2001.
5. Primrose, S.B., Twyman, R.M., Primrose, S.B., and Primrose, S.B. *Principles of gene manipulation and genomics*. Malden, MA: Blackwell Pub, 2006.

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2. https://ocw.mit.edu.
3. https://link.springer.com/book/10.1007/978-3-540-72800-9.
4. https://www.amazon.in/Applied-Bioinformatics-Paul-Maria-Selzer-ebook/dp/B001AUOYY2.
5. https://books.google.co.in/books/about/Applied_Bioinformatics.html?id=PXZZDwAAQBAJ&redir_esc=y

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - IV: BIOSTATISTICS
(23PBYO26)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To provide the student with a conceptual overview of statistical methods.
- To emphasis on usefulness of commonly used statistical software.
- To understand and evaluate critically the acquisition of data and its representation.
- To gain the knowledge about the probability and statistical inference about the graphical representation of data.
- To learn more about how to organize, create, and carry out the distribution of scientific knowledge.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: identify and interpret visual representations of quantitative information, such as graphs or charts
CO2[K2]: explain the latest version using in statistical tools and application
CO3[K3]: solve problems quantitatively using appropriate arithmetical, algebraic, or statistical methods
CO4[K4]: examine their competence in hypothesis testing and interpretation
CO5[K5]: assess why biologists need a background in statistics

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	2	3	3	3	3	2	2
CO3[K3]	3	3	3	3	3	2	3
CO4[K4]	3	3	3	3	3	3	3
CO5[K5]	3	2	2	2	3	3	3
Weightage of the course	14	14	14	14	15	13	13
Weighted percentage of course contribution to POs	**3.63**	**4.12**	**4.36**	**4.64**	**5.62**	**5.24**	**5.46**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

INTRODUCTION TO STATISTICS: Introduction to biostatistics, basic principles, variables - Collection of data, sample collection and representation of Data - Primary and Secondary - Classification and tabulation of Data – Diagrams, graphs and presentation.

UNIT II **(9 hrs)**

DESCRIPTIVE STATISTICS: Mean, median and mode for continuous and discontinuous variables. Measures of dispersion: Range of variation, standard deviation and standard error and coefficient variation.

UNIT III **(9 hrs)**

PROBABILITY: Basic principles - types - Rules of probability - addition and multiplication rules.

PROBABILITY DISTRIBUTION: Patterns of probability distribution; binomial - Poisson and normal.

UNIT IV **(9 hrs)**

HYPOTHESIS TESTING: Chi-square test for goodness of fit; Null hypothesis, level of Significance - Degrees of Freedom. Student 't' test – paired sample and mean differences 't' tests. ANOVA. Basic introduction to Multivariate Analysis of Variance (MANOVA).

UNIT V **(9 hrs)**

CORRELATION AND REGRESSION: Correlation - types of correlation - methods of study of correlation - testing the significance of the coefficients of correlation. Regression and types. Sampling and experimental designs of research-Randomized block design and split plot design.

TEXTBOOKS

1. Gurumani, N. *Biostatistics*, 2nd edn. MJP publications, India, 2005.
2. Datta, A.K. *Basic Biostatistics and Its Applications*. New Central Book Agency. ISBN 8173815038, 2006.
3. Pillai, R.S.N and Bagavathi, V.S. *Statistics theory and practice*. Chand & Co. Ltd, New Delhi, 2010.
4. Mahajan, B.K. *Methods in Biostatistics for Medical students and Research works*. Smt. Indu Mahajan, New Delhi, 1984.
5. Pillai, R.S.N and Bagavathi, V.S. *Statistics theory and practice*. Chand & Co. Ltd, New Delhi, 2010.
6. Khan, I.D and Khanum, A. *Fundamentals of Biostatistics*, Ukazsz Publications, Hyderabad, India, 2004.

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1. Milton, J.S. *Statistical method in Biological and Health Sciences*. McGraw Hill Inc., New York, 1992.
2. Schefler, W.C. *Statistics for biological sciences*, Addision- Wesely Publication Co., London, 1968.
3. Spiegel, M.R. *Theory and Problems of statistics*, Schaum's Outline series McGraw-Hill International Book Co., Singapore, 1981.
4. Pillai, R.S.N and Bagawathi, V. *Practical Statistics* (For B.Com. and B.A., Students) S.Chand & Co. (Pvt.) Ltd., New York, 1987.
5. Sobl. R.R and Rohif, F.J. *Biometry*. The principles and Practice and Statistics in Biological Research. W.H. Freman and Co., San Francisco, 1969.
6. Zar, J.K. *Biostatistical Analysis*, Fourth Edition, Prantice-Hall International, New Jersey, USA.

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1. nu.libguides.com/biostatistics
2. https://newonline courses.sciences.psu.edu/
3. https://bookauthority.org/books/beginner-biostatistics-ebooks
4. https://www.amazon.com/dp/1478638184?tag=uuid10-20

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - IV: INTELLECTUAL PROPERTY RIGHTS (23PBYO27)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To cater to the needs of the stakeholders of knowledge economy is designed for those interested in managers and similar individuals.
- To create awareness of current IPR and innovation trends.
- To disseminate information on patents, patent system in India and overseas and registration related issues.
- To pursue a career in IPR, offers chances for IP consultants and attorneys.
- To develop skill sets to enable you to comprehend and assess the methods used in knowledge based economy and innovation ecosystems.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall the history and foundation of Intellectual Property
CO2[K2]: summarize the differences of property and assets and various categories of intellectual creativity
CO3[K3]: apply the methods to protect the intellectual property
CO4[K4]: differentiate if the Said Intangible property be protected under law or protected by strategy
CO5[K5]: document on the methods and procedures of protecting the said IP and search documents to substantiate them

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	2	3	3	3	3	2	2
CO3[K3]	3	3	3	3	3	2	3
CO4[K4]	3	3	3	3	3	3	3
CO5[K5]	3	2	2	2	3	3	3
Weightage of the course	14	14	14	14	15	13	13
Weighted percentage of course contribution to POs	**3.63**	**4.12**	**4.36**	**4.64**	**5.62**	**5.24**	**5.46**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

INTRODUCTION TO IPR: History and Development of IPR. Theories on concept of property: Tangible *vs* Intangible. Subject matters patentable in India. Non patentable subject matters in India. Patents: Criteria of Patentability, Patentable Inventions - Process and Product. Concept of Copyright. Historical Evolution of Copyright Ownership of copyright, Assignment and license of copyright.

UNIT II **(9 hrs)**

OVERVIEW OF THE IPR REGIME AND DESIGN: International treaties signed by India. IPR and Constitution of India. World Intellectual Property Organization (WIPO): Functions of WIPO, Membership, GATT Agreement. Major Conventions on IP: Berne Convention, Paris Convention. TRIPS agreement. Industrial Designs – Subject matter of Design – Exclusion of Designs – Novelty and originality – Rights in Industrial Design.

UNIT III **(9 hrs)**

TRADE MARK, LEGISLATIONS AND PATENT ACT: History of Indian Patent Act 1970. Overview of IP laws in India. Major IP Laws in India. Patent Amendment Act 2005. WTO-TRIPS – Key effect on Indian Legislation. Organization of Patent System in India. Concept of Trademarks, Different kinds of marks, Criteria for registration, Non Registrable Trademarks, Registration of Trademarks. Infringement: Remedies and Penalties.

UNIT IV **(9 hrs)**

PRIOR ART SEARCH AND DRAFTING: Overview of Patent Search. Advantages of patent search. Open source and paid databases for Patent Search. International Patent classification system. Types of specifications: Drafting of Provisional specifications. Drafting of complete specifications. Drafting of claims.

UNIT V **(9 hrs)**

GI AND PATENT FILING PROCEDURES: Geographical Indications of Goods (Registration and Protection) Infringement – Offences and Penalties Remedies. Plant Variety and Farmers Right Act (PPVFR). Plant variety protection: Access and Benefit Sharing (ABS). Procedure for registration, effect of registration and term of protection. Role of NBA. Filing procedure for Ordinary application. Convention application. PCT National Phase application. Process of Obtaining a Patent. Infringement and Enforcement.

TEXTBOOKS

1. Kalyan, C.K. *Indian Patent Law and Practice, India*, Oxford University Press, 2010.
2. Ahuja, V.K. *Law relating to Intellectual Property Rights*. India, IN: Lexis Nexis, 2017.
3. Arthur Raphael Miller, Micheal Davis H. *Intellectual Property: Patents, Trademarks and Copyright in a Nutshell*, West Group Publishers, 2000.
4. Margreth, B. *Intellectual Property*, 3nd, New York Aspen publishers, 2009.
5. Nithyananda, K.V. *Intellectual Property Rights: Protection and Management. India*, IN: Cengage Learning India Private Limited, 2019.
6. Venkataraman M. *An introduction to Intellectual property rights*. Create space Independent Pub.North Charleston, USA, 2015.

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1. Anant Padmanabhan. *Intellectual Property Rights: Infringement and Remedies* LexisNexis Butterworths Wadhwa, 2012.
2. Intellectual Property Law in the Asia Pacific Region. Kluwer Max Planck Series, 2009.
3. Pradeep, S. Mehta (ed.). *Towards Functional Competition Policy for India*, Academic Foundation, Related, 2005.
4. Ramakrishna B and Anil Kumar, H.S. *Fundamentals of Intellectual Property Rights: For Students*, Industrialist and Patent Lawyers, Notion Press, Chennai, 2017.
5. Damodar Reddy, S.V. *Intellectual Property Rights -- Law and Practice*, Asia Law House, Hyderabad, 2019.

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2. https://www.wipo.int/about-ip/en/
3. http://www.ipindia.nic.in/
4. https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - IV:
NANOBIOTECHNOLOGY (23PBYO28)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To introduce the basic concepts in the emerging frontiers of nanotechnology.
- To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.
- To introduce the concepts in nanomaterials and their use with biocomponents to synthesize and interact with larger systems.
- To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.
- To incorporate sustainability for develop nanotechnology responsibly.

Course Outcomes (CO)

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

CO1[K1]: recall the essential features of biology and nanotechnology that are converging to create the new area of bionanotechnology
CO2[K2]: discuss a procedures for the synthesis of nanoparticles which are of medical importance which could be used to treat specific diseases
CO3[K3]: estimate the various types of nano particle synthesis and advocate promotes the use of nano materials and anno composites
CO4[K4]: analyze and apply the important of nanoparticles in plant diversity
CO5[K5]: evaluate various types of nanomaterial for application of environment

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	3	3	3	2
CO2[K2]	2	3	3	3	3	2	2
CO3[K3]	3	3	3	3	3	2	3
CO4[K4]	3	3	3	3	3	3	3
CO5[K5]	3	2	2	2	3	3	3
Weightage of the course	14	14	14	14	15	13	13
Weighted percentage of course contribution to POs	**3.63**	**4.12**	**4.36**	**4.64**	**5.62**	**5.24**	**5.46**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

BASIC CONCEPTS IN NANOBIOLOGY: History of Nanotechnology, Difference between Nanoscience and Nanotechnology, Green nanotechnology, Bottom up and top down approaches.

UNIT II **(9 hrs)**

DIVERSITY IN NANOSYSTEMS: Carbon based nanostructures - fullerences, nanotubes, nanoshells, buckyballs – biomolecules and nanoparticles, nanosensors, nanomaterials - Classification based on dimensionality quantum dots, wells and wires – metal based nano materials (gold, silver and oxides) - Nanocomposites- Nanopolymers – Nanoglasses–Nano ceramics.

UNIT III **(9 hrs)**

METHODS OF NANOBIOTECHNOLOGY: Optical tools – Nanoforce and imaging – Surface methods – Mass spectrometry – Electrical Characterization and Dynamics of Transport – Microfludics: Concepts and applications to the Life Sciences.

UNIT IV **(9 hrs)**

NANOBIOTECHNOLOGY: Nanodevices and nanomachines based on biological nanostructures - Protein and DNA nanoarrays, tissue engineering, and luminescent quantum dots for biological labeling.

UNIT V **(9 hrs)**

APPLICATIONS OF NANOBIOTECHNOLOGY: Real Time PCR – Biosensors From the glucose electrode to the Biochip – DNA Microarrays – Protein Microarrays – Cell Biochips – Lab on a chip – Polyelectrolyte multilayers – Biointegrating materials – Pharmaceutical applications of nanoparticles carriers.

TEXTBOOKS

1. Dupas, C, Houdy, P., Lahmani, M. *Nanoscience: —Nanotechnologies and Nanophysics*||, Springer-Verlag Berlin Heidelberg, 2007.
2. Sharon, M and Sharon, M. *Bio-Nanotechnology- Concepts and Applications*, CRC Press, 2012.
3. Atkinson, W.I. *Nanotechnology*. Jaico Book House, New Delhi, 2011.
4. Nalwa, H.S. *Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology*. American Scientific Publ, 2005.
5. Lindsay, S.M. *Introduction to Nanoscience*, Oxford universal Press, First Edition, 2011.
6. Jain K.K. *Nanobiotechnology molecular diagnostics: Current techniques and application* (Horizon Bioscience).Taylor & Francis 1st edition, 2006.

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1. Claudio Nicolini. *Nanotechnology Nanosciences*, Pon Stanford Pub.Pvt.Ltd, 2009.
2. Robert, A and Ferias, Jr. *Nanomedicine*, Volume I: Basic capabilities, Landes Bioscience, 1999.
3. Barbara Panessa-Warren. *Understanding cell-nanoparticle interactions making nanoparticles more biocompatible*. Brookhaven National Laboratory, 2006.
4. European Commission, SCENIHR. *Potential risks associated with engineered and adventitious products of nanotechnologies*, European Union, 2006.
5. Gysell Mortimer, *The interaction of synthetic nanoparticles with biological systems* PhD Thesis, School of Biomedical Sciences, Univ.of Queensland, 2011.

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2. https://www.elsevier.com/books/nanobiotechnology/ghosh/978-0-12-822878-4
3. https://www.routledge.com/Nanobiotechnology-Concepts-and-Applications-in-Health-Agriculture-and/Tomar-Jyoti-Kaushik/p/book/9781774635179
4. https://www.nanowerk.com/nanotechnology/periodicals/ebook a.php
5. https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/
7. https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html
8. http://www.particle-works.com/applications/controlled-drug-release/Applications

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
NON-MAJOR ELECTIVE COURSE - I: HOME GARDENING (23PBYN21)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To introduces the students to study the different types of gardens, establishment of techniques.
- To know the usage of seasonal vegetables in local area.
- To learn the cultivation and maintenance of home garden.
- To study on cultivation and importance of hydroponics techniques.
- To importance of Process and management of kitchen waste for home garden.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: illustrate the types and significance of gardening
CO2[K2]: explain garden tools and its applications
CO3[K3]: develop the vegetable crop cultivation
CO4[K4]: justify the importance of home garden and gardening techniques
CO5[K5]: assess the steps involved in home garden establishment.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	1	2	1	1	2
CO2[K2]	3	2	-	2	1	2	3
CO3[K3]	2	1	3	1	2	2	1
CO4[K4]	3	-	2	2	3	3	2
CO5[K5]	1	2	3	3	1	1	3
Weightage of the course	11	7	9	10	8	9	11
Weighted percentage of course contribution to POs	**2.85**	**2.06**	**2.8**	**3.31**	**3**	**3.63**	**4.62**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Concept of gardening - History - Types of garden, Famous gardens in India. Gardening as a hobby and resource. Designing of vegetable garden (Garden plan - fencing, clearing the land, leveling, preparing the soil, monitoring and maintenance). Importance of soil in gardening. Compost and farmyard manure.

UNIT II **(12 hrs)**

Basic gardening tools – Spading Fork, Trowel, Steel rack, Hoe, Cultivator and Hand pruner. Choice of plants - Ornamental and horticultural attributes, selection of seeds, seed germination tests, sowing, direct sowing, thinning, preparation of seed bed, weeding, transplantation, plant protection measures.

UNIT III **(12 hrs)**

Schedule for maintenance: Need for maintenance, watering, furrow irrigation, sprinkler watering, drip irrigation, weed control, soil tillage, pest control, disease control. Harvesting the produce, storing and processing of the vegetables.

UNIT IV **(12 hrs)**

Hydroponics - cultivation, cultivation of tomato through hydroponics, advantages of hydroponics. Storage and marketing activities of hydroponics. Terrace garden establishment and it uses. Vertical and Roof top garden.

UNIT V **(12 hrs)**

Importance of home garden, Plan of kitchen garden. Seasonal vegetables - Athalakkai, Greens, Tomato, Brinjal, Lady's finger, Cucumber, Beans, Drumstick, Banana. Rose, Jasmine, Papaya and Crotons. Process and management of kitchen waste for home garden.

TEXTBOOKS

1. Gordon-Wells Jr, E. *Successful Home Gardening*. 2nd Volume, CA, USA, 2010.
2. Gordon-Wells Jr, E. *Successful Home Gardening*. 3nd Volume, CA, USA, 2014.
3. Smith M. *Advanced Home Gardening, Creative*. Homwowner, USA, 2001.

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1. FAO. *A Vegetable garden for all*, 5th Edition, Rome, Italy, 2014.
2. Davis KC. *School and home gardening*, JB Lippincott Company, Philadelphia, 1918.
3. Palmer I. *The House Gardener*, Ryland Peters & Small, UK. 2014.

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1. https://www.youtube.com/watch?v=WNrggnnkkWM
2. https://www.youtube.com/watch?v=ufBy2Hpzr0s

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
SKILL ENHANCEMENT COURSE - II: AGRICULTURE AND FOOD MICROBIOLOGY (23PBYS21)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To provide comprehensive knowledge about plant – microbe interactions.
- To provide basic understanding about factors affecting growth of microbes
- To appreciate the role of microbes in food preservation.
- To understand about the benefits of microbes in agriculture and food industry.
- To gain knowledge about practices involved in food industry.

Course Outcomes (CO)

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

CO1[K1]: recognize the general characteristics of microbes and factors affecting its growth

CO2[K2]: explain the significance of microbes in increasing soil fertility

CO3[K3]: find the concepts of microbial interactions with plant and food

CO4[K4]: analyze the impact of harmful microbes in agriculture and food industry

CO5[K5]: conclude and appreciate the role of microbes in food preservation and as biocontrol

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	1	3	2	2	3
CO2[K2]	3	3	2	2	3	2	3
CO3[K3]	2	2	3	3	1	3	2
CO4[K4]	3	3	3	3	3	3	3
CO5[K5]	3	3	2	3	2	3	2
Weightage of the course	14	14	11	14	11	13	13
Weighted percentage of course contribution to POs	**3.63**	**4.12**	**3.43**	**4.64**	**4.12**	**5.24**	**5.46**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

ROLE OF MICROORGANISMS IN AGRICULTURE: Role of symbiotic and free-living bacteria and cyanobacteria in agriculture., Mycorrhiza, Plant Growth Promoting Microorganims (PGPM) and Phosphate Solubilizing Microorganims (PSM).

UNIT II **(9 hrs)**

BIOCONTROL AND BIOFERTILIZATION: Biocontrol of plant pathogens, pests and weeds, Restoration of waste and degraded lands,Biofertilizers: Types, technology for their production and application, vermi-compost.

UNIT III **(9 hrs)**

FOOD MICROBIOLOGY: Intrinsic and extrinsic factors influencing growth of microorganisms in food, Microbes as source of food: Mushrooms, single cell protein.

UNIT IV **(9 hrs)**

FOOD MICROBIOLOGY: Microbial spoilage of food and food products: Cereals, vegetables, prickles, fish and dairy products. Food poisoning and food intoxication. Food preservation processes. Microbes and fermented foods: Butter, cheese and bakery products.

UNIT V **(9 hrs)**

PREDICTIVE METHODS: Using Protein Sequences Protein Identity Based on Composition - Physical Properties Based on Sequence - Motifs and Patterns - Secondary Structure and Folding Classes - Specialized Structures or Features - Tertiary Structure.

TEXTBOOKS

1. Pelczar M.J., Chan E.C.S. and Krieg N.R. *Microbiology*. 5th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
2. Subba Rao, N. S. *Soil microbiology*. 4th Edition, Oxford and IBH publishing Co. Pvt. Ltd., Calcutta, New Delhi, India, 2000.
3. Rangaswami, G. and Bagyaraj, D.J. *Agricultural Microbiology*. 2nd Unit 2nd Edition, PHI Learning, New Delhi, India, 2006.
4. Prescott, L.M., Harley J.P., Klein D. A. *Microbiology*, McGraw Hill, India. 6th edition, 2005.
5. Goldman, E. and Green, L.H. *Practical Handbook of Microbiology* (3rd Ed.). CRC Press, 2015.

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1. Adams, M.R. and Moss M. O. *Food Microbiology*, 3rd Edition, Royal Society of Chemistry, Cambridge, U.K, 2008.

2. Sylvia D.M. *Principles and Applications of Soil Microbiology*, 2nd Edition, Prentice Hall, USA, 2004.
3. Frazier, W.C. *Food Microbiology*, 4th Edition, Tata McGraw Hill Education, Noida, India, 1995.
4. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. *Industrial Microbiology: An Introduction*. 1st Edition, Blackwell Science, London, UK, 2001.
5. Das, S. and Saha, R. *Microbiology Practical Manual*. CBS Publishers and Distributors (P) Ltd., New Delhi, India, 2020.

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2. https://agrimoon.com/agricultural-microbiology-icar-ecourse-pdf-book/
3. https://play.google.com/store/books/details/Applied_Microbiology_Agriculture_Environmental_Foo?id=DgVLDwAAQBAJ&hl=en_US&gl=US
4. https://www.scientificpubonline.com/websitebooks/ebooks/agriculture/microbiology
5. https://www.amazon.in/Food-Microbiology-Martin-R-Adams-ebook/dp/B01D6B7V6A

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - VIII: CELL AND MOLECULAR BIOLOGY (23PBYC31)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS: 25**
CREDITS : 4 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To enable to learn cell structures and functions of prokaryotes and eukaryotes.
- To understand the cell division and it molecular mechanism.
- To enlighten people of past molecular biology developments
- To comprehend the molecular processes.
- To examination of DNA structure, replication process, transcription process and translation processes.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall a plant cell structure and explain its function
CO2[K2]: illustrate and explain the structure of various cell organelles
CO3[K3]: explain the structure and functional significance of nucleic acid
CO4[K4]: compare and contrast the DNA replication
CO5[K5]: discuss skills for DNA manipulating and the enzymes involved.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	2	1	1	1
CO2[K2]	3	2	2	-	1	1	1
CO3[K3]	3	2	2	1	1	1	1
CO4[K4]	3	2	3	1	2	1	1
CO5[K5]	3	2	2	2	2	1	1
Weightage of the course	15	11	12	6	7	5	5
Weighted percentage of Course contribution to POs	**3.89**	**3.24**	**3.74**	**1.99**	**2.62**	**2.02**	**2.1**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

The dynamic cells, Concept of prokaryote and Eukaryote. Structural organization of plant cell, specialized plant cell types chemical foundation. Cell wall- Structure and functions, Plasma membrane; structure, models and functions, site for ATPase, ion carriers channels and pumps, receptors. Plasmodesmata and its role in movement of molecule.

UNIT II **(12 hrs)**

Chloroplast-structure and function, genome organization, gene expression, RNA editing, Mitochondria; structure, genome organization, biogenesis. Plant Vacuole - Tonoplast membrane, ATPases transporters as a storage organelle. Structure and function of other cell organelles- Golgi apparatus, lysosomes, endoplasmic reticulum and microbodies.

UNIT III **(12 hrs)**

Nucleus: Structure and function, nuclear pore, Nucleosome organization, euchromatin and heterochromatin. Ribosome- Structure and functional significance. RNA and DNA Structure. A, B and Z Forms. Replication, transcription, translation in prokaryotes and eukaryotes. DNA damage and repair (Thymine dimer, photoreactivation, excision repair). Cell cycle and Apoptosis; Control mechanisms, role of cyclin dependent kinases. Retinoblastoma and E2F proteins, cytokinesis and cell plate formation, mechanisms of programmed cell death

UNIT IV **(12 hrs)**

DNA replication (prokaryotes and eukaryotes), enzymes involved in replication, DNA repair. DNA sequencing. Transcription, enzymes involved in transcription, post transcription changes, reverse transcription, Translation. overlapping genes

UNIT V **(12 hrs)**

DNA/gene manipulating enzymes: endonuclease, ligase, polymerase, phosphatase, transcriptase, transferase, topoisomerase. Gene cloning: cloning vectors, molecular cloning and DNA libraries. Molecular genetic elements, insertion elements, transposons. Recombinant DNA. Direct and indirect gene transfer. Detection of recombinant molecule, production of gene products from cloned genes. Genome library, cDNA library.

TEXTBOOKS

1. Roy, S.C. and Kumar, K.D.C. *Cell Biology*. New Central Book Agency, Calcutta. 1977.
2. Karp, G. *Cell and Molecular Biology: Concepts and Experiments (6th edition)*. John Wiley & Sons. 2010.

3. Aminul, I. *Text Book of Cell Biology.* Books and Allied (P) Ltd, Kolkata, India. 2011.
4. Geoffrey M. Cooper. *The Cell: A Molecular Approach*. Oxford University Press. 2019.
5. Turner, P.C., Mclenann, A.G., Bates, A.D. and White, M.R.H. *Instant notes on molecular biology*. 2001.
6. Watson, J.D., Baker T.A., Bell S.P., Gann A., Levine M. and Losick R. *Molecular Biology of the Gene (7th edition)*. Pearson Press. 2014.
7. Snustad Peter and Michael J.Simmons. *Principles of Genetics*. John Wiley Sons. 2015.
8. Clark, D. *Molecular Biology*. Academic Press Publication. 2010.
9. David Freifelder. *Essentials of Molecular Biology.* Narosa Publishing house. New Delhi. 2008.
10. Geoffrey M.Cooper and Robert E.Hausman. *The Cell: A Molecular Approach (*7th *edition)*. Sinauer Associates is an imprint of Oxford University Press. 2015.

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1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J. D. *Molecular biology of the Cell (2nd edition)*. Garland Pub. Inc., New York. 1989.
2. Karp, G. *Cells and Molecular Biology: Concepts & Experiments.* John Wiley and Sons, Inc., USA. 1999.
3. Lodish, S., Baltimore, B., Berk, C. and Lawrence, K. *Molecular Cell Biology* (3rd edition), Scientific American Books, N.Y. 1995 .
4. De Robertis and De Robertis. *Cell and Molecular Biology*, 8th edn, Info-Med, Hongkong. 1988.

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2. http://www.bio-nica.info/Biblioteca/Bolsover2004CellBiology.pdf
3. https://www.e-booksdirectory.com/listing.php?category=549
4. https://www.elsevier.com/books/molecular-biology/clark/978-0-12-813288-3
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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - IX: GENETICS, PLANT BREEDING AND BIOSTATISTICS
(23PBYC32)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS: 25**
CREDITS : 4 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To understanding of laws of inheritance, genetic basis of loci and alleles and their linkage.
- To develop critical understanding of chemical basis of genes.
- To familiarize with genetic basis of heterosis.
- To role of various non-conventional methods used in crop improvement.
- To solve problems using arithmetical, algebraic or statistical methods.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: enumerate the Mendal's Law of inheritance and gene interactions
CO2[K2]: trace the factors determining heredity from one generation to another
CO3[K3]: explain Gene mapping methods**:** Linkage maps
CO4[K4]: compare the genetic basis of breeding self and cross pollinated crops
CO5[K5]: discuss the statistical analysis of biological problems.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	1	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	3	2	2	5	-	-	1
CO4[K4]	3	2	2	1	2	-	1
CO5[K5]	3	2	2	1	-	2	0
Weightage of the course	15	10	10	9	4	5	2
Weighted percentage of Course contribution to POs	**3.89**	**2.94**	**3.12**	**2.98**	**1.5**	**2.02**	**0.84**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Mendal's Law of inheritance. Gene interactions and modified dihybrid ratios. Quantitative inheritance. Sex determination in plants and theories of sex determination. Sex linked characters. Structure of Gene, Operon, inducible operon, Operator site, Promoter, Polycistronic m RNA, Regulator, regulator constitutive, Regulator super repressor, repressor, super repressor, inducer. Gene function and regulation in prokaryotes with reference to Lac operon and trp operon. Producer gene, structural gene and integrator gene. Gene Regulation eukaryotes –Britten and Davidson model, Arabidopsis- gene regulation in flowering.

UNIT II **(12 hrs)**

Recombination: Homologous and non-homologous recombination, site-specific recombination. Holiday model of recombination. Transposable genetic elements: Ac element, transposase, transposon, simple transposon, composite transposon, Is element. Transposons in *Zea mays*. Transposable elements in prokaryotes. UV induced mutation and its repair mechanism. Mismatch DNA repair mechanism. Mutation types- frame shift mutation, addition, deletion, substitution, transition and transversion. Xeroderma pigmentosum.

UNIT III **(12 hrs)**

Multiple gene interaction, QTL mapping, Gene mapping methods**:** Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids. Extra chromosomal inheritance, maternal inheritance. Organelle genomes: Organization and functions of chloroplast and mitochondrial DNA.

UNIT IV **(12 hrs)**

PLANT BREEDING: Objectives of plant breeding, characteristics improved by plant breeding, Genetic basis of breeding self and cross – pollinated crops. Pure line theory, pure line selection and mass selection, clonal selection methods. Hybridization, Genetics and physiological basis of heterosis.

UNIT V **(12 hrs)**

BIOSTATISTICS: Measures of central tendency (Mean, Median, Mode) and dispersal (Mean deviation, standard deviation), standard errors ANOVA (One way). probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; X2 test; basic introduction to Multivariate statistics, etc.

TEXTBOOKS

1. Benjamin, A.Pierce. *Genetics- A conceptual Approach*. W.H. Freeman and Company, New York, England, 2012.
2. Stansfield, W.D. *Theory and problems of Genetics*. McGraw-Hill, 1969.
3. Sinnott, E.W., Dunn, L.E and Dobzhansky, T. *Principles of Genetics.* McGraw-Hill. New York, 1973.
4. Chaudhari, H.K. *Elementary Principles of Plant Breeding*. Oxford & IBH Publishing Company, 1984.
5. Brown, T.A. *Genetics a Molecular Approach, 2nd Ed*. Chapman and Hall, 1992.
6. Chahal, G.S and Gosal, S.S. *Principles and Procedures of Plant Breeding Biotechnological and Conventional Approaches*. Narosa Publishing House, New Delhi, 2018.

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1. Watson, J.D. *et al. Molecular Biology of the Gene*. Fourth Edition. The Benjamin Cummings Pub. Co, 2003.
2. Lewin, B. *Genes VIII*. Oxford University Press, 2003.
3. Friefelder, D. *Molecular Biology*. Second Edition. NarosaPub.House, 2005.
4. Sobtir, C. and Gobe. *Eukaryotic chromosomes*. Narosa Publishinghouse, 1991.
1. Smith-Keary, P. *Molecular Genetics.* Macmillan Pub. Co. Ltd. London, 1991.
2. Acquaah, G. *Principles of Plant Genetics and Breeding.* Blackwell Publishing, 2007.
3. William.S., Klug and Michael, R. Cummings. *Concepts of Genetics*. Seventh edition. Pearson Education (Singapore) Pvt. Ltd., 2003.
4. Simmonds, N.W. *Principles of Crop improvement.* Longman, London, 1979.
5. Lewin, B. *Genes VII*. Oxford University Press, USA, 2000.
6. Strickberger, M.W. *Genetics (III Ed).* Prentice Hall, New Delhi, India, 2005.

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1. https://www.cdc.gov/genomics/about/basics.htm
2. https://ocw.mit.edu/courses/biology/7-03-genetics-fall-2004/lecture-notes/
3. http://galaxy.ustc.edu.cn:30803/zhangwen/Biostatistics/Fundamentals+of+Biostatistics+8th+edition.pdf
4. https://www.britannica.com/science/evolution-scientific-theory
5. https://www.britannica.com/science/cell-biology
6. https://medlineplus.gov/genetocs/understanding/basics/cell/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - X: RECOMBINANT DNA TECHNOLOGY AND INDUSTRIAL APPLICATIONS (23PBYC33)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To students should be familiar with the basics of genetics and molecular biology.
- To understanding the chemical basis of genes and evolutionary levels.
- To learn the applied aspects of production of recombined new plants.
- To understanding the principles, tools and practices of rDNA technology
- To gain basic understanding of rDNA techniques and its applications.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: demonstrate and to recollect the production of vitamins
CO2[K2]: summarize the basics of recombinant DNA technology
CO3[K3]: compare and contrast the recombined organism and natural organisms
CO4[K4]: analyze the production of antibiotics
CO5[K5]: create skills for rDNA techniques and producing hybrids varieties.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	1	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	3	2	2	5	-	-	1
CO4[K4]	3	2	2	1	2	-	1
CO5[K5]	3	2	2	1	-	2	0
Weightage of the course	15	10	10	9	4	5	2
Weighted percentage of Course contribution to POs	**3.89**	**2.94**	**3.12**	**2.98**	**1.5**	**2.02**	**0.84**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Recombinant DNA (DNA insertion in to Plasmid). Transformation. Direct and indirect gene transfer. Detection of recombinant molecule, production of gene products from cloned genes. Genome library, cDNA library.Vitamins, antibiotics, enzymes, anticancer drugs, interferons, etc., are produced using this technology.

UNIT II **(12 hrs)**

For the production of vitamins: Vitamins like B12 are produced by recombinant bacteria like Paracoccusdenitrificans, Propionibacteriumshermanii, *E.Coli* bacteria on a large scale by fermentation. Vitamin-C is produced on a large scale from Saccharomyces cerevisiae and Zygosaccharomyces bailii yeast and Gluconobacteroxydans bacteria.

UNIT III **(12 hrs)**

Production of antibiotic medicines: Human Deoxyribonuclease I, Human Tissue Plasminogen Activator, β-Glucocerebrosidase, L-Asparaginase, Deoxycytidine kinase, Acid sphingomyelinase Antibiotics are anti-bacterial molecules produced by other microbes.

UNIT IV **(12 hrs)**

Recombinant hormones**:** insulin (somatotrophin), erythropoietin used in the treatment of anemia. For the production of vaccines Hepatitis B vaccine Interferons Interferon-alfa- hairy cell leukemia. Interferon-Beta-1b is used to treat relapsing multiple sclerosis, malignant glioma, and melanoma.

UNIT V **(12 hrs)**

rDNA technology uses in animal husbandry and sericulture**.** milk production in cattle, cheese ripening, and reduction of lactose levels. Fungal α-amylase silk production in sericulture. Uses in agriculture**.** rDNA technology can produce high yielding plants with the desired quality. Disease resistant crops like Bt-cotton, BT-brinjal, golden rice.

TEXTBOOKS

1. Neal Stewart, Jr. *Plant Biotechnology and Genetics: Principles, Techniques and Applications.* John Wiley & Sons Inc,2008.
2. Smith. J.K. *Biotechnology – 3 rd Ed*. Cambridge Univ. Press, Cambridge, 1996.
3. Khan. I.A. and A. Khanum. *Fundamentals of Biotechnology – Forensic Science Genetic Engineering.* Ukaaz publication, Hyderabad, 2004.
4. Mba, C., Afza, R., Bado, S., and Jain, S.M. *Plant Cell Culture: Essential Methods*. John Wiley & Sons, UK, 2010.
5. Abdin, M.Z., Kiran, U., Kamaluddin, M., Ali, A. (Eds.). *Plant Biotechnology: Principles and Applications*. Springer publishers, 2017.

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1. Watson, J.D. *et al. Molecular Biology of the Gene. Fourth Edition*. The Benjamin Cummings Pub. Co, 2003.
2. Lewin, B. *Genes VIII*. Oxford University Press, 2003.
3. Friefelder, D. *Molecular Biology. Second Edition.* NarosaPub.House, 2005.
4. Sobtir.C. and Gobe. *Eukaryotic chromosomes.* Narosa Publishinghouse, 1991.
5. Smith-Keary, P. *Molecular Genetics.* Macmillan Pub. Co. Ltd. London, 1991.

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1. https://www.nature.com/scitable/topic/cell-biology
2. https://plato.stanford.edu/entries/molecular-biology/
3. https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/bioinformatics
4. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470686522
5. https://books.google.co.in/books?id=oe_liIY_tVsC&printsec=frontcover#v=onepage&q&f=false

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE –XI: CORE INDUSTRY MODULE: INDUSTRIAL BOTANY
(23PBYC34)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To learn the applied aspects of industrial applications.
- The student would be competent to work in industries.
- To educate people about the widespread commercial uses of fungi
- To know about the economic importance of plants.
- To acquire knowledge on *in vitro* cultivation techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: summarize the basics of algae in industrial applications
CO2[K2]: illustrate the uses in fungi in industries
CO3[K3]: explain bacterial role in industries
CO4[K4]: compare and contrast the use of plants in industries
CO5[K5]: discuss and develop skills for working in industries specializing in biomolecules.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	2	2	2	2
CO2[K2]	2	3	3	1	2	3	1
CO3[K3]	3	2	2	1	1	2	1
CO4[K4]	3	3	2	2	2	2	2
CO5[K5]	2	3	2	3	2	3	2
Weightage of the course	12	13	11	09	09	12	08
Weighted percentage of Course contribution to POs	**3.11**	**3.82**	**3.43**	**2.98**	**3.37**	**4.84**	**3.36**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

ALGAE IN INDUSTRIES: Fertilizer industry-Seaweeds, pharmaceutical industry – antibiotics, agar, carageenin, alginin, diatomate earth, mineral industry, fodder industry

UNIT II **(12 hrs)**

FUNGI IN INDUSTRIES: Beneficial use of yeast, Fermentation of alcohol, preparations of enzyme, organic acid preparation, cheese production, protein manufacture, vitamins, fats.

UNIT III **(12 hrs)**

PLANT PRODUCTS: Fibres and Fibre-Yielding Plants, wood and cork, tannins and dyes, rubber, fatty oils and Vegetable fats, sugars and starches, pulp and paper, gums and resins.

UNIT IV **(12 hrs)**

BACTERIA IN INDUSTRY: Food industry, dairy products, bioleaching, biogas production**,** bioremediation

UNIT V **(12 hrs)**

RECOMBINANT PLANTS: Tissue culture: Micropropagation, somatic seeds, cell culture.

TEXTBOOKS

1. Trivedi, P.C. *Algal Biotechnology*. Point publisher, Jaipur. India, 2001.
2. Dinabandhu, S and Kaushik. B.D. *Algal Biotechnology and Environment*. I.K. International, New Delhi, 2012.
3. Poonam Singh and Ashok Pandey. *Biotechnology for agro-Industrial residues utilization*. Springer, 2009.
4. Dilip K. Arora. *Handbook of Fungal Biotechnology*. CRC Press book, 2003.
5. Vardhana, R. *Economic Botany. 1st ed.* Sarup Book Publishers Pvt Ltd. New Delhi, 2009.
6. Dubey R.C. *A text book of Biotechnology aspects of microbiology*. British Sun Publication, 2004.
7. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. *Microbiology.* Tata MaGraw Hill Publishing House, New Delhi, 1983.
8. Narayanaswamy, S. *Plant Cell and Tissue Culture.* Tata McGraw Hill Ltd. New Delhi, 1994.

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1. Becker. E.W. *Micro algae Biotechnology and Microbiology.* Cambridge University press, 1994.
2. Borowitzka, M.A. and borowizka, L.J. *Microalgal Biotechnology.* Cambridge University Press, Cambridge, 1996.

3. Sahoo, D. *Farming the ocean: seaweed cultivation and utilization.* Aravali International, New Delhi, 2000.
4. Mahendra Rai. *Advances in Fungal Biotechnology.* I.K. International Publishing House, New Delhi, 2009.
5. Street, H.E. *Essay in Plant Taxonomy.* Academic Press, London, UK, 1978.
6. Alexander N. Glazer and Hiroshi Nikaido. *Microbial Biotechnology*, 1994.
7. Pandey, B.P. *College Botany I: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta.* S Chand & Company, 2005.
8. Chichister, U.K.J. *Cultivation and Processing of Medicinal Plants*. Wiley & Sons, 1999.
9. William Charles Evans. *Pharmacognosy*. 14th ed. Harcourt Brace & Company, 1989.
10. Kumar,H.D. *Introductory Phycology*. Affiliated East-West Press, Delhi, 1999.
11. Das,SandSaha,R. *Microbiology Practical Manual*. CBS Publishers and Distributors (P) Ltd., New Delhi, India, 2020.
12. Willie, J and Sherwood, L. *Prescott's Microbiology McGraw-Hill Education; 10th Edition*. ISBN: 978-1259281594, 2016.
13. Reinert, J. Bajaj. T.P.S. *Applied and Fundamental Aspects of Plant cell, tissue and organ Culture*. Springer – Verlaug, 1977.

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1. https://www.elsevier.com/books/algal-biotechnology/ahmad/978-0-323-90476-6
2. https://www.amazon.in/Fungi-Biotechnology-Prakash-ebook/dp/B07PBF2R3D
3. https://www.amazon.in/Plant-Based-Natural-Products-Derivatives-Applications-ebook/dp/B07438N1CJ
4. https://link.springer.com/book/10.1007/978-981-16-5214-1
5. https://link.springer.com/book/10.1385/0896031616

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE –XII: PRACTICAL: CELL AND MOLECULAR BIOLOGY AND GENETICS, PLANT BREEDING AND BIOSTATISTICS & RECOMBINANT DNA TECHNOLOGY AND INDUSTRIAL APPLICATIONS (23PBYC3P)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 25**
CREDITS : 4 **EXT. MARKS : 75**
DURATION : 75 hrs **MAX. MARKS : 100**

Course Objectives

- To observe the different stages of mitosis and chromosome behaviour
- To explain the principles of linkage, crossing over and hereditary mechanisms.
- To expose the students to gain recent advances in molecular biology.
- To understand the principles of plant breeding for the crop improvement.
- To understand the principles of rDNA techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: recall the various aspects of cell biology, and molecular biology
CO2[K3]: discuss the concepts of cell biology, genetics and plant breeding
CO3[K4]: compare the sequence of plant gDNA and bacterial plasmid DNA
CO4[K5]: explain the molecules isolated from cell
CO5[K6]: evaluate the theory and practical skills gained during the course.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	1	-	-	1	1	-
CO2[K3]	3	1	1	2	2	1	-
CO3[K4]	3	3	2	2	1	1	2
CO4[K5]	2	3	2	2	3	1	2
CO5[K6]	2	3	3	2	3	3	2
Weightage of the course	13	11	8	8	10	7	6
Weighted percentage of Course contribution to POs	**3.39**	**3.23**	**2.51**	**2.66**	**3.66**	**2.8**	**2.48**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(15 hrs)**

CELL AND MOLECULAR BIOLOGY

1. Identification of different stages of mitosis from suitable plant material. (Onion root tips, garlic root tips).
2. Identification of meiosis from suitable plant material. (Onion/Tradeschantia floral buds).
3. Isolation of cell organelles : Mitochondria, Chloroplast, Nucleus, Lysosomes and there assay by succinate dehydrogenase activity (Mitochondria), acid phosphatase activity (Lysosome), acetocarmine staining (Nucleus) and microscopic observation (Chloroplast)
4. Study of mitotic index from suitable plant material.
5. Study of cyclosis in cells of suitable plant material.
6. To study plant vacuole in cells of onion leaf peel.
7. Restriction digestion of DNA samples using restriction endonucleases (RE).
8. To study the structure and organization of plant cell in various tissues of various plants (incl. leaf, stem and roots).

UNIT II **(15 hrs)**

GENETICS

1. Problem solving on dihybrid phenotypic, genotypic and test cross ratios.
2. Incomplete dominance in plants.
3. Interactions of factors and modified dihybrid ratios.
4. Multiple alleles in plants, blood group inheritance in human.
5. Sex linked inheritance in Drosophila and plants.
6. Quantitative inheritance in plants.
7. Tetrad analysis in Neurospora.
8. Complementation analysis to find out complementation groups in viruses.
9. Chromosome mapping from three point test cross data. Calculation chiasmatic interference.
10. Calculate gene and genotypic frequency by Hardy- Weinberg equation.

UNIT III **(15 hrs)**

1. Techniques in plant hybridization.

UNIT IV **(15 hrs)**

rDNA TECHNOLOGY

1. Isolation of genomic DNA.
2. Electrophoresis of nucleic acid.
3. Preparation of competent *E.coli* cells.
4. Transformation and recovery of plasmid clones.
5. Isolation of plasmid DNA.

UNIT V **(15 hrs)**

rDNA TECHNOLOGY

1. Southern blot.
2. Plasmid insertion techniques
3. Recombinant plasmids

TEXTBOOKS

1. George M.Malacinski. *Freifelders Essentials of Molecular Biology (4th ed.).* Jones & Bartlett, 2015.
2. Gupta P.K. *Cell and Molecular Biology (5th ed.).* Rastogi Publications, Meerut, 2017.
3. Gupta, P.K. *Cytogenetics*. Rastogi Publications, Meerut, 2018.
4. Kumar, H.D. *Molecular Biology and Biotechnology*. Vikas Publishing House, New Delhi, 2007.
5. Bharadwaj, D.N. *Breeding of field crops (pp. 1-23).* Agrobios (India), 2012.
6. Singh, R.J. *Plant Cytogenetics.* CRC press, US, 2016.

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1. Gardener, J, Simmons, H.J and Snustad, D.P. *Principle of Genetics*. John Wiley & Sons, New York, 2006.
2. De Robertis E.D.P. and De Robertis E.M.P. *Cell and Molecular Biology (8thed.)* (South Asian Edition). Lea and Febiger, Philadelphia, USA, 2017.
3. Jackson, S.A., Kianian, S.F., Hossain, K.G., and Walling, J. G. *Practical laboratory exercises for plant molecular cytogenetics. In Plant Cytogenetics (pp. 323-333).* Springer, New York, NY, 2012.
4. Glick, B.R and J.E. Thompson. *Methods in Plant Molecular Biology and Biotechnology.* CRC Press, Boca Raton, Florida, 1993.
5. Glover, D.M and B.D. Hames (Eds). *DNA cloning 1: A Practical Approach; Core Techniques, 2nd edition* PAS, IRL press at Oxford University Press, Oxford, 1995.
6. Gunning, B.E.S and M. W. Steer. *Plant Cell Biology: Structure and function.* Jones and Bartlett Publishers, Boston, Massachusetts, 1996.

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2. https://www.bjcancer.org/Sites OldFiles/ Library/UserFiles/pdf/Cell Biology Laboratory Manual.pdf
3. https://www.kopykitab.com/Genetics-With-Practicals-by-Prof-S-S-Patole-Dr-V-R-Borane-Dr-R-K-Petare
4. https://www.kopykitab.com/Practical-Plant-Breeding-by-Gupta-S-k
5. https://www.kopykitab.com/Cell-And-Molecular-Biology-A-Lab-Manual-by-K-V-Chaitanya
6. https://www.amazon.in/Plant-Tissue-Culture-Theory-Practicals/dp/9386347350

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - V: SECONDARY PLANT PRODUCTS AND FERMENTATION BIOTECHNOLOGY (23PBYO31)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS: 75**
DURATION : 45 hrs **MAX. MARKS: 100**

Course Objectives

- To familiar with the basics of biochemistry and fermentation
- To understand secondary metabolites.
- To enhance knowledge for self-employment of microbial derived products.
- To apply the microbial culture in the manufacturing of value added products.
- To critically analyze the types of bioreactors and the fermentation process.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: compare the types of bioreactors and the fermentation process
CO2[K2]: describe the role of microorganisms in industry
CO3[K3]: list out and explain the types of bioreactors
CO4[K4]: categorize the significance of intrinsic and extrinsic factors on growth of microorganism
CO5[K5]: evaluate the concept of downstream processing.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	2	2	3	3	2
CO2[K2]	3	3	3	1	3	2	2
CO3[K3]	3	2	2	2	2	1	1
CO4[K4]	3	2	2	2	2	1	2
CO5[K5]	2	3	2	1	2	2	1
Weightage of the course	14	13	11	8	12	9	8
Weighted percentage of Course contribution to POs	**3.64**	**3.8**	**3.44**	**2.67**	**4.36**	**3.54**	**3.25**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

SECONDARY METABOLITES: A brief account of acetate malonate, acetate mevalonate and shikimic acid pathways. Categories of phytochemicals – Phenols, alkaloids, flavonoids, terpenoids, steroids, glycosides, carbohydrates, proteins, amino acids, lipids, pigments, vitamins and other related compounds.

UNIT II **(9 hrs)**

MICROBIAL GROWTH: Factors affecting microbial growth; Stoichiometry: mass balances; Stoichiometry: energy balances; Growth kinetics; Measurement of growth.

UNIT III **(9 hrs)**

BIOREACTORS: Introduction to bioreactors; Batch and Fed-batch bioreactors, Continuous bioreactors; Immobilized cells; Bioreactor operation; Sterilization; Aeration; Sensors; Instrumentation; Culture-specific design aspects: plant/mammalian cell culture reactors. Bioseparations: Biomass removal; Biomass disruption; Membrane-based techniques; Extraction; Adsorption and Chromatography Industrial Processes and Process economics: Description of industrial processes; Process flow sheeting; Process economics.

UNIT IV **(9 hrs)**

DOWNSTREAM PROCESSING: Biomass removal and disruption; Centrifugation; sedimentation; Flocculation; Microfiltration; Sonication; Bead mills; Homogenizers; Chemical lysis; Enzymatic lysis; Membrane based purification: Ultrafiltration ; Reverse osmosis; Dialysis ; Diafiltration ; Pervaporation; Perstraction; Adsorption and chromatography: size, charge, shape, hydrophobic interactions, Biological affinity; Process configurations (packed bed, expanded bed, simulated moving beds); Precipitation (Ammonium Sulfate, solvent); Electrophoresis(capillary); Crystallization; Extraction (solvent, aqueous two phase, super critical), Drying; Case studies

UNIT V **(9 hrs)**

IMPORTANT PRODUCTS THROUGH FERMENTATION: Organic acids citric acid acetic acid, enzymes – amylase, protease, lipase, antibiotics – penicillin, vitamins – B12, amino acids – glycine, glutamic acid, organic solvenst – ethanol, butanol, acetone, alcoholic beverages – wine, beer, biomass – bakers yeast, biosurfactants, biopesticides, biopolymers.

TEXTBOOKS

1. Shuler, M. L and Kargi, F. *Bioprocess Engineering.* Prentice Hall Inc, 2002.
2. Doran, P.M. *Bioprocess Engineering Principles*. Elsevier, 1995.
3. Kaufman, P.B.L.J.Cseke, Warler, S., Duke, J.A. and Brielmann, H.L. *Natural Products from Plants*. CRC Press LLC, 1999.

4. Casia, J.R.L.E. *Industrial Microbiology.* New Age International (P) Ltd. Publisher, New Delhi, 2009.
5. Stanbury, P.F., Whitaker, A. and Hall, S.J. *Principles of Fermentation Technology*. Aditya Books (P) Ltd., New Delhi, 1979.
6. Potter, N.N. *Food Science*. CBS Publishers, 2007.

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1. Rehm, H.J and Reed, G. *Biotechnology- A multi- Volume Comprehensive Treatise*. 2nd Ed, Vol 3, Wiley-VCH, 1993.
2. Moo-Young, M. *Comprehensive Biotechnology* Vol. 2. Pergamon Press, 2004.
3. Dicosmo, F and Missawa, M. *Plant Cell Culture Secondary Metabolism: Towards Industrial Application*. CRC LLC, 1996.
4. Frazier, W.C. and Weshoff, D.C. *Food Microbiology* (5th edition) McgrawHill, 2015.
5. Kumari, S. *Basics of Food Biochemistry and Microbiology*. Koros Press, 2012.
6. Whitaker. J.R. *Handbook of Food Enzymology*. CRC press, 2016.
7. Shewfelt, R.L. *Introducing Food Science.* CRC Press, 2013.
8. Smith, J.S and Hui, Y.H. *Food Processing.* Wiley, 2014.
9. Varzakas, T and Tzia, C. *Handbook of Food Processing.* CRC Press, 2016.

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2. https://www.elsevier.com/books/secondary-plant-products/stumpf/978-0-12-675407-0
3. https://www.amazon.in/Secondary-Plant-Products-Comprehensive-Biochemistry-ebook/dp/B01E3II0E2
4. https://www.pdfdrive.com/principles-of-fermentation-technology-e40900163.html
5. https://link.springer.com/book/10.1007/978-3-030-16230-6

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - V: ENTREPRENEURIAL OPPORTUNITIES IN BOTANY (23PBYO32)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the concepts of nursery management and horticultural crops.
- To develop competency on pre and post-harvest technology in crops.
- To analyze the different methods of weed control and harvest treatments.
- To examine the economic implications of cultivation vegetable crops.
- To evaluate the importance of floriculture and contribution spices.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall the knowledge about organic farming and advantages
CO2[K2]: illustrate the horticultural techniques to students can develop self employment and economical improvement
CO3[K3]: construct the kitchen garden or terrace garden in their living area
CO4[K4]: analyze both the theoretical and practical knowledge in understanding various horticultural techniques
CO5[K5]: create and develop skills for mushroom cultivation.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	2	2	3	3	2
CO2[K2]	3	3	3	1	3	2	2
CO3[K3]	3	2	2	2	2	1	1
CO4[K4]	3	2	2	2	2	1	2
CO5[K5]	2	3	2	1	2	2	1
Weightage of the course	14	13	11	8	12	9	8
Weighted percentage of Course contribution to POs	**3.64**	**3.8**	**3.44**	**2.67**	**4.36**	**3.54**	**3.25**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

Organic manures and fertilizers. Composition of fertilizer, NPK content of various fertilizers. Common organic manures bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost. Preparation of compost, aerobic and anaerobic – advantages. Vermicompost preparation, vermiwash. Panchakaviyam.

UNIT II **(9 hrs)**

Common garden tools. Methods of plant propagation by seeds. Vegetative propagation, cutting, grafting, budding and layering. Use of growth regulators for rooting.

UNIT III **(9 hrs)**

BIOREACTORS: Gardening – types of garden, ornamental, indoor garden, kitchen garden, terrace garden, vegetable garden for marketing. Rockery and artificial ponds. Ornamental garden designing, garden components flower beds, borders, hedges, edges, drives, paths, garden adornments.

UNIT IV **(9 hrs)**

Packaging of fruits, vegetables. Preservation techniques drying, heat treatment, low temperature storage and by chemicals. Preparation of wine, vinegar and dairy products.

UNIT V **(9 hrs)**

Significance of mushrooms. Types of mushrooms (button mushroom, oyster mushroom). Spawn isolation and preparation. Cultivation. Value added products from mushroom – pickles, candies and dried mushrooms.

TEXTBOOKS

1. Chmielewski, J.G and Krayesky, D. *General Botany laboratory Manual*. Author House, Bloomington, USA, 2013.
2. Russell, T. *Nature Guide: Trees: The world in your hands (Nature Guides).* Mukherjee D. Gardening in India, Oxford IBH publishing co, New Delhi, 2012.
3. Kumar, N. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, 1997.
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6. Singh, R and U.C. Singh. *Modern mushroom cultivation, 3d Edition* Agrobios (India), Jodhpur, 2020.

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7. Gupta. P.K., *Elements of Biotechnology*. Rastogi publications, Meerut, 1998.
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3. https://www.ebooks.com/en-us/subjects/gardening/
4. https://www.amazon.in/Preservation-Techniques-Publishing-Technology-Nutrition-ebook/dp/B00RXCXB3Q
5. https://www.elsevier.com/books/food-preservation-techniques/zeuthen/978-1-85573-530-9

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - V: APPLIED PLANT CELL AND TISSUE CULTURE (23PBYO33)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To comprehend the principles and methodologies of plant tissue culture.
- To acquire knowledge on *in vitro* cultivation techniques for commercialization.
- To know the techniques of tissue culture for metabolites production.
- To recognize the worth of traditional germplasm to meet consumer demand.
- To impart practical information on plant tissue culture.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall the principles and culture techniques of callus, organs, pollen
CO2[K2]: discuss the techniques used in plant growth and regeneration horticultural techniques under *in vitro* conditions
CO3[K3]: examine the tissue culture media and culturing of organs or whole plant
CO4[K4]: analyze the conditions for direct and indirect plant regeneration
CO5[K5]: evaluate the skills obtained from internal and external assessment systems.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	2	2	3	3	2
CO2[K2]	3	3	3	1	3	2	2
CO3[K3]	3	2	2	2	2	1	1
CO4[K4]	3	2	2	2	2	1	2
CO5[K5]	2	3	2	1	2	2	1
Weightage of the course	14	13	11	8	12	9	8
Weighted percentage of Course contribution to POs	**3.64**	**3.8**	**3.44**	**2.67**	**4.36**	**3.54**	**3.25**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

BASIC PLANT TISSUE CULTURE: Totipotency and concepts of plant tissue culture – Laboratory organization – Design of different laboratories and management - Aseptic techniques - Plant culture media – Inorganic nutrients – Macronutrients – Micronutrients - Carbon and energy sources – Organic supplements – Growth regulators – Solidifying agent – MS medium and B5 medium – Explant preparation - Methods of sterilization – Transfer and incubation of culture – Transplantation area.

UNIT II **(9 hrs)**

MICROPROPAGATION: Micropropagation – Stages of micropropagation - Multiplication by axillary and apical shoots – Multiplication by adventitious shoots – Multiplication through callus culture – Organogenesis and somatic embryogenesis – Multiplication and Rooting - Hardening - Factors effecting micropropagation – Technical problems in micropropagation - Practical applications of micropropagation – Somaclonal & gametoclonal variation – synthetic seed technology - Shoot tip/Meristem culture for virus free plants.

UNIT III **(9 hrs)**

CELL AND PROTOPLAST CULTURES AND HAPLOID PRODUCTION: Single cell and cell suspension culture – Applications - Production of haploids - Anther culture and pollen culture – Induction of haploids from un-pollinated ovaries and ovules – Role of haploids in Plant breeding - Protoplast culture: Protoplast isolation, purification – regeneration – culturing. Protoplast fusion techniques – somatic hybridization and cybridization - Applications of protoplast culture and hybridization.

UNIT IV **(9 hrs)**

METABOLIC ENGINEERING: Application of cell culture systems in metabolic engineering - advantages of cell, tissue and organ culture as a source of secondary metabolites - Hairy root culture - Screening of high yielding cell lines - Procedures for extraction of high value industrial products – Alkaloids, food additives and insecticides in *in vitro* system.

UNIT V **(9 hrs)**

CRYOPRESERVATION AND BIOREACTORS: Germplasm storage and conservation – Methods of in vitro conservation – Cryopreservation and steps involved in cryopreservation of plant materials - Types of bioreactors (Stirred tank and airlift) and their uses - Industrial scaling – Upstream and downstream processing - Manipulation in production profile by biotic and abiotic elicitation – Biotransformation – Food vaccines, bioplastics, plantibodies, plantigens - Applications of tissue culture in agriculture, Horticulture and forestry.

TEXTBOOKS

1. Narayanaswamy, S. *Plant cell and tissue culture*. 8th edn. Tata McGraw Hill Publ. ISBN 0074602772, 1999.
2. Bhojwani, S.S and Razdan, M.K. *Plant Tissue Culture,* Read Elsevier India Pvt. Ltd. ISBN 818147 3256, 2004.
3. Trigiano, R.N and D.J. Gray (eds.). *Plant tissue culture concepts and laboratory exercises*. CRC Press. (Textbook). 2nd Edition, 2000.
4. Kyte, M and Kleyn, J. *Plant from test tubes*. Timber Press. Auge, R. et al., 1995. In vitro culture and its applications in horticulture. Science Publishers, Inc, 1996.
5. Auge, R. *In vitro culture and its applications in horticulture*. Science Publishers, Inc, 1995.
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7. Khasim, S.M. *Botanical Microtechnique: Principles and Practice*, Capital Publishing Company, New Delhi, 2002.
8. Srivastava, P.S. *Plant Tissue Culture and Molecular Biology*. N.R. Book Distributors, New Delhi, 1998.

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2. Vasil, I.K. and Thorpe, T.A. *Plant Cell and Tissue Culture*, Kluwer Academic Press, The Netherlands, 1994.
3. Loyola-Vargas, V.M. Ochoa-Alejo, N. *Somatic embryogenesis: Fundamental aspects and applications*, Springer international publishing, Switzerland, 2016.
4. Elhiti, M., Stasolla, C and Wang, A. *Molecular regulation of plant somatic embryogenesis. In Vitro Cellular & Developmental Biology-Plant*, 49(6), 631-642, 2013.
5. Collins, H.A. and Edwards, S. *Plant Cell Culture,* Bios Scientific Publishers, Oxford, UK, 1998.
6. Hall, R.D. (Ed.). *Plant Tissue Culture: Techniques and Experiments*, Academic Press, New York, 1999.
7. Kartha, K.K. *Cyropreservation of plant cells and organs*. CRC Press, Boca Raton, Florida, 1985.
8. Rihan, H.Z., Kareem, F., El-Mahrouk, M.E., and Fuller, M.P. *Artificial seeds (principle, aspects and applications)*. Agronomy, 7(4), 7, 2017.

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2. http://ugcmoocs.inflibnet.ac.in/ugcmoocs/spoc.php?coordinator=574
3. https://www.youtube.com/watch?v=bi755vQVNx8
4. https://www.elsevier.com/books/plant-tissue-culture/park/978-0-12-821120-5
5. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470686522

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - V: SILVICULTURE AND COMMERCIAL LANDSCAPING (23PBYO34)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the basic concepts of horticulture.
- To learn the various methods of plant propagation.
- To know the art of fruit crop and vegetable crop cultivation.
- To know about the fundamental concepts of gardening and landscaping.
- To provide an overview of various gardening styles and its scope.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: demonstrate the art of floriculture and landscape gardening
CO2[K2]: generalise the importance and divisions of horticulture
CO3[K3]: explain plant propagation and fruit crop cultivation
CO4[K4]: compare and contrast the vegetable cultivation and kitchen gardening
CO5[K5]: discuss and develop skills for effective understanding on landscaping and components of gardens.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	2	2	3	3	2
CO2[K2]	3	3	3	1	3	2	2
CO3[K3]	3	2	2	2	2	1	1
CO4[K4]	3	2	2	2	2	1	2
CO5[K5]	2	3	2	1	2	2	1
Weightage of the course	14	13	11	8	12	9	8
Weighted percentage of Course contribution to POs	**3.64**	**3.8**	**3.44**	**2.67**	**4.36**	**3.54**	**3.25**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

Basics of Horticulture: Importance and scope of Horticulture - Divisions of Horticulture – Climate, soil and nutritional needs – Manures and fertilizers – Organic manures – Inorganic fertilizers – Biofertilizers – Methods of applications of manures and fertilizers - Water irrigation – Surface irrigation – Sub irrigation – Special irrigation methods – Plant protection and pest control for horticulture crops.

UNIT II **(9 hrs)**

Plant propagation: Natural method: Propagation through seeds and specialized vegetative structures - Artificial methods: Cutting: types (root, stem, leaf cuttings), advantages and disadvantages - Layering: types (simple, compound, tip, trench, mound, air-layering) advantages and disadvantages - Grafting: types (inarching, side, splice, whip/tongue, veneer, cleft, bark, epicotyl, top-working) advantages and disadvantages - Budding: Types (T-budding, shield, patch, and ring budding) advantages and disadvantages - Stock – scion relationships – Micropropagation.

UNIT III **(9 hrs)**

Fruit crops: Training and pruning methods for fruit plants – Induction of flowering, flower thinning - fruit setting and fruit development – Seedlessness in horticultural fruits – Importance of plant growth regulators in fruit crops – Cultivation and harvesting methods of important fruit crops; Mango, Sapota, Pomegranate, Grapes and Guava.

UNIT IV **(9 hrs)**

Flower and vegetable crops: Floriculture – Cultivation of commercial flower crops – Rose, Jasmine, Chrysanthemum, Crossandra, Anthurium and Gerberas – Cut flowers – Vase life period – Packages for export of cut flowers - Flower decoration – Dry and wet decoration - State Integrated Board of Studies – Botany PG 32 Classification of vegetables – Cultivation of important vegetables - Tomato, Potato, Onion, Cabbage and Snake guard – Layout for a model kitchen garden.

UNIT V **(9 hrs)**

Landscape designing: Principles and methods of landscape designing – Types of garden – Garden components – Shrubs and shrubberies, ornamental hedges, edges, flower beds, borders and carpet beds – Climbers and creepers – Foliage plants - Succulents and cacti – Ornamental palms – Orchids - Topiary and trophy - Rockeries and arches – Lawn making and maintenance – Water garden - Layout for college garden - Indoor gardening – Hanging baskets - Bonsai plants – Training and pruning - Terrace garden - Cultivation of tree species – Eucalyptus and teak.

TEXTBOOKS

1. Edmond, J.B. *Fundamentals of Horticulture*. Tata McGraw Hill Publishers Co. Ltd., New Delhi, 1977.
2. Kumar, N. *Introduction to Horticulture*, Midtech Publisher, 2017.
3. Manibushan Rao, K. *Textbook of Horticulture*. Macmillan Publishing Co., New York, 1991.
4. Rao, K.M. *Text book of Horticulture*. Macmillan India Ltd, New Delhi, 2000.
5. George, A. *Horticulture Principles and Practices*. 2nd Edition. Pearson Education, Delhi, 2002.
6. Bohra, M.P.S. and Arora, *Introduction to Horticulture*, 2 nd Edition, 2017.
7. Singh, J. *Fundamentals of Horticulture*. Kalyani Publishers, 2018.
8. Acquaah, J. *Horticulture – principles and practices*, 4th edition, PHI learning Pvt. Ltd, 2009.
9. Rao Manibhushan K. *Textbook of horticulture*. MaC Millan India Ltd, 1991.
10. Gangulee H. C. and Kar A. K. *College Botany Vol II*, New Central Book Agency, 2004.
11. Sharma V. K. *Encyclopedia of Practical Horticulture*, Vol I –IV, Deep And Deep Publ. Pvt. Ltd, 1999.

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1. Edment Senn Andrews. *Fundamentals of Horticulture.* Tata. McGraw Hill Publishing Co., Ltd., Delhi, 1994.
2. Adams. *Principles of Horticulture*. IVth Ed. Elsevier India Pv. Ltd, 2005.
3. Antje Rugullis. 1001 *Garden Plants and Flowers*. Parragon Publishers, 2008.
4. Berry, F. and Kress, J*. Heliconia: An Identification Guide* . Smithsonian Books, 1991.
5. Butts, E. and Stensson, K. *Sheridan Nurseries: One hundred years of People,Plans, and Plants*. Dundurn Group Ltd, 2012.
6. Russell, T. *Nature Guide: Trees: The world in your hands* (Nature Guides), 2012.

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3. https://pace.oregonstate.edu/catalog/master-gardener-series-oregon-master-gardener-program
4. https://www.amazon.in/Gardening-Landscape-Design-and-Botanical Garden/s?rh=n%3A1318122031%2Cp_27%3Aand+Botanical+Garden
5. https://www.overdrive.com/subjects/gardening
6. https://www.scribd.com/book/530538456/Opportunities-in-Landscape-Architecture-Botanical-Gardens-and-Arboreta-Careers

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
NON-MAJOR ELECTIVE COURSE - II: MUSHROOM CULTIVATION TECHNOLOGY (23PBYN31)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To make the learners self reliant to identify several kind of mushrooms.
- To enhance the knowledge in the biology of mushroom.
- To develop the skill for the cultivation of mushroom.
- To know the culture of disease free mushroom.
- To provide training on mushroom cultivation, packaging and marketing.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: detail the general characters mushroom
CO2[K2]: explain spawn preparation techniques
CO3[K3]: employ the mushroom cultivation techniques
CO4[K4]: examine the control measurement against diseases of mushroom
CO5[K5]: differentiate the edible and poisonous mushroom.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	1	1	-	-	-
CO2[K2]	2	2	2	1	-	1	-
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	-
CO5[K5]	2	1	2	1	1	-	1
Weightage of the course	10	08	09	05	03	03	02
Weighted percentage of Course contribution to POs	**2.6**	**2.34**	**2.81**	**1.67**	**1.09**	**1.18**	**0.81**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

Mushroom Biology: Introduction, characteristics and Economic importance of mushrooms. Key to differentiate between edible and poisonous mushroom. Basic Systematic Position – Morphology – Climatic Needs – Distribution and General Characters of *Agaricus, Calocybe* and *Pleurotus* Spp.

UNIT II **(9 hrs)**

Mushroom Cultivation Technology: Prospects of Tropical Mushroom Cultivation Technology (Include Pure Culture and Spawn Preparation): Oyster Mushroom (*Pleurotus florida*) – Milky Mushroom (*Calocybe indica*) – Button Mushroom (*Agaricus bisporus*). Post Harvest Technology. Mushroom Farming and Prospects.

UNIT III **(9 hrs)**

Diseases in Mushroom: Diseases - Common Pests. Disease prevention and Control Measures. **Processing** – Blanching – Steeping – Sun Drying – Canning – Pickling – Freeze Drying. Storage: Short Term and Long Term Storage.

UNIT IV **(9 hrs)**

Mushroom Economy: Production Level – Economic Return – Foreign Exchange from Mushroom Cultivating Countries and International Trade. Nutritional Composition and Medicinal uses of Mushrooms. Recipes of Mushroom.

UNIT V **(9 hrs)**

Mushroom Shed Construction and Cost of Cultivation – Oyster and Milky Mushroom. Factors affecting mushroom Cultivation. Mushroom Cultivation Training Units and Research Centres in India. 1. Field Visit to Mushroom Farms. 2. Demonstration on Various Stages of Mushroom Cultivation. 3. Interaction with Mushroom Farmers. 4. Mini Project Work and Report Submission.

TEXTBOOKS

1. Shu-Ting Chang and Philip G. Miles. *Mushrooms Cultivation, Nutritional Value, Medicinal Effect and Environmental Impact*. CRC Press Boca Raton London New York Washington, D.C. 2004.
2. Paul Stamets J.S., and Chilton. *The Mushroom Cultivator - A practical guide to growing mushrooms at home*. Agariikon Press Olyivipia, Washington, 1983.
3. Tripathi, D.P. *Mushroom Cultivation*. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi, 2005.

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1. Kaul, T.N. *Biology and conservation of mushrooms.* Oxford and IBH publishing company New Delhi, 2001.
2. Harander Singh. *Mushrooms- The Art of Cultivation*. Sterling Publishers, 1991.
3. Peter. *Mushroom Cultivation.* 3rd Edition. Backhuyes Publisher USA, 2000.

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2. https://agricoop.nic.in/sites/default/files/ICAR_8.pdf
3. https://agritech.tnau.ac.in/postharvest/pht_faq.html

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
SKILL ENHANCEMENT COURSE - III: PLANT GENOMICS (23PBYS31)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 3 (L-2, T-1) **INT. MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 45 hrs **MAX. MARKS : 100**

Course Objectives

- To learn about the tools of genomics to increase their understanding of plant function
- To study of individual genes and their roles in inheritance.
- To understand the type of genome mapping.
- To develop the skills for uses the genome database.
- To know the usage of the tools for genome analysis.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: illustrate the structure of the chloroplast genome
CO2[K2]: examine the different types of Plant genome database
CO3[K3]: write the difference between genetic and physical mapping
CO4[K4]: explain the tools which are involved in the Genome analysis
CO5[K5]: discuss the phylogenetic anlaysis using Genomic tools.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	3	1	2	1	-	1
CO2[K2]	3	2	2	3	2	1	2
CO3[K3]	2	2	2	2	1	1	1
CO4[K4]	3	3	1	2	2	2	-
CO5[K5]	2	3	2	1	1	1	2
Weightage of the course	12	13	8	10	7	5	6
Weighted percentage of Course contribution to POs	**3.12**	**3.8**	**2.5**	**3.33**	**2.55**	**1.97**	**2.44**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(9 hrs)**

Basics of Genomics: Introduction to genomics, Overview plant genome organization, Extra-chromosomal DNA: mitochondria and chloroplast. Structure of Chloroplast genome.

UNIT II **(9 hrs)**

Plant Genome Databases and genome browsers. Applications of Plant Genome Databases and analysis of plant genomic data.

UNIT III **(9 hrs)**

Genome mapping: Genetic and physical mapping, Markers for genetic mapping, FISH technique in gene mapping, comparative gene mapping

UNIT IV **(9 hrs)**

Tools for Genome Analysis–RFLP- RAPD. Demonstration of Polymerase chain reaction (PCR). Genetic diversity analysis using PCR techniques.

UNIT V **(9 hrs)**

Phylogenetic analysis using genomic tools. Applications of plant genomics. Concept of pharmacogenomics. Concept of epigenomics. microRNA, long non-coding RNA.

TEXTBOOKS

1. Gresshoff P M, *Plant Genome Analysis*, Crc Press. January 2010
2. Poltroneri, *Plant Genomics to Plant Biotechnology*, Palmiro. 2017.

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1. Mount David W, *bioinformatics: sequence and genome analysis*, 2nd edition. 1 January 2004.
2. Teresa K. Attwood and David J. Parry-Smith, *Introduction to Bioinformatics*. Addison Wesley Longman Limited. 1999.

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2. https://link.springer.com/book/10.1007/978-1-4939-7003-2

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER – III
INTERNSHIP/INDUSTRIAL TRAINING (23PBYJ31)
(From 2023-2024 Batch onwards)

HOURS/WEEK : - **INT.MARKS : 25**
CREDITS : 2 **EXT. MARKS : 75**
DURATION : 25 Days **MAX.MARKS :100**

Course Objectives:

- To learn and develop new skills relevant to the field of study or career interests.
- To understand different departments, roles, and functions within the organization to broaden knowledge and explore potential career paths.
- To apply the knowledge gained in academic studies to real-world scenarios.
- To bridge the gap between classroom learning and professional life.
- To gain exposure to different tasks, projects, and challenges relevant to the chosen field.

Course Outcomes (CO)

On Successful completion of the course, the learners will be able to

CO1[K2]: identify different career paths within the industry and gain insights into potential future roles.

CO2[K3]: apply theoretical concepts and academic knowledge to real-world situations and challenges encountered during the internship.

CO3[K4]: analyze problems, generate innovative solutions, and make informed decisions.

CO4[K5]: evaluate how to manage time effectively and prioritize tasks to meet deadlines and deliver quality work.

CO5[K6]: create a portfolio of the work, projects, and achievements during the internship.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	-	1	1	1	2
CO2[K3]	2	3	-	1	-	1	2
CO3[K4]	2	2	-	2	-	1	1
CO4[K5]	-	2	1	-	-	1	1
CO5[K6]	1	3	3	3	-	1	2
Weightage of the course	8	12	4	07	01	05	08
Weighted percentage of Course contribution to POs	**2.04**	**3.39**	**1.23**	**2.28**	**0.36**	**1.93**	**3.15**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Rules and Regulations

1. Each Student has to undergo 25 days institutional/industry based training during the fourth semester summer vacation.
2. Internships could be undertaken in different media organizations, industries and educational institutions which should be approved by the department.
3. Students should keep a detailed record of activities performed and hours spent in training and report the same to the Faculty Coordinator/Mentor/ Guide regularly about the progress of internship on weekly basis
4. At the end of the internship, the student must submit a full-fledged detailed internship report (not exceeding 20 pages) along with attendance certificate
5. The Internship carries 100 marks out of which 25 marks for Internal and 75 marks for External.
6. The viva voce board shall consist of the Head of the Department and the internal Examiner (Senior Faculty member)
7. The training programme shall be evaluated as per the following pattern

Internal (25 Marks)		**External (75 Marks)**	
Training Review	: 15 Marks	Training Report	: 25 Marks
Daily Log Report	: 5 Marks	Viva Voce	: 50 Marks
PPT Presentation	: 5 Marks		

EACH INTERNSHIP REPORT WILL FOLLOW THE FORMAT DESCRIBED:

- Title Page
- College Certificate Page
- Internship Certificate provided by the internship institution
- Declaration Page
- Acknowledgement
- Company Profile
- Organizational structure of the concern
- Weekly work plan
- List of figures, List of Tables
- Index
- Chapters

List of Chapters

1. Introduction
2. Nature of work
3. Role in the organization
4. Questionnaires and Observations about work
5. Operating Environment
6. Detailed Description of Technology used
7. Implementation

8. Conclusion
9. Appendix

Text Format in the report : Times New Roman 12 with 1.5 line
Margins 1.5" left and 1" all other

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE –XIII: PLANT PHYSIOLOGY AND PLANT METABOLISM
(23PBYC41)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To acquire knowledge on the functional aspects of plants.
- To understand the biophysical and biochemical processes of plants.
- To study the metabolism of plants.
- To learn the plant growth regulations.
- To know the adaptive mechanisms of plants in adverse environmental conditions.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: relate understand properties and importance of water in biological
CO2[K2]: discuss the importance of light in plant growth and energy harvest
CO3[K3]: explain the energy requirement and nitrogen metabolism
CO4[K4]: compare the various growth regulators that influence plant growth
CO5[K5]: discuss the senescence and plant response to environmental stress.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	1	-	1	-
CO2[K2]	3	2	2	1	1	-	1
CO3[K3]	2	3	2	2	-	1	1
CO4[K4]	3	2	3	2	2	1	2
CO5[K5]	2	2	2	2	1	1	1
Weightage of the course	13	12	12	08	04	04	05
Weighted percentage of Course contribution to POs	**3.31**	**3.39**	**3.7**	**2.61**	**1.45**	**1.54**	**1.97**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Water Relations: Physical and chemical properties of water –Components of water potential - Plasmolysis - water absorption by roots – Apoplast and Symplast concept - water transport through the xylem –– Transpiration and evapotranspiration- stomatal structure and function – mechanism of stomatal opening and closing – mineral nutrition – essential nutrients – macro and micro nutrients – deficiencies and plant disorders – absorption of solutes – translocation of solutes – pathways and mechanisms. phloem loading and unloading - translocation of photosynthates – source- sink relationship – partitioning of assimilates and harvest index.

UNIT II **(12 hrs)**

Photosynthesis: The physical nature of light – the absorption and fate of light energy – absorption and action spectra- photoreceptors- Ultrastructure and biochemical compartmentation of Chloroplast; Photosynthetic Electron Transport and Photophosphorylation (cyclic and noncyclic): Photosystems and reaction centres - Light Harvesting complexes - Photosystem I & II and Oxidation of Water; Carbon metabolism: C3, C4 and CAM pathways and their distinguishing features - photorespiration and its significance. Biochemistry and Molecular Biology of RUBISCO.

UNIT III **(12 hrs)**

An overview of plant respiration – Glycolysis – TCA cycle– Electron Transport – oxidative phosphorylation and ATP synthesis – Chemiosmotic Theory - Pentose Phosphate Pathway– Respiration and its significance in crop improvement. Cyanide resistant respiration; Nitrogen fixation (Biological - symbiotic and non-symbiotic), Physiology and Biochemistry of nitrogen fixation State Integrated Board of Studies – Botany PG 40.

UNIT IV **(12 hrs)**

Growth and development – Phases of plant growth – growth types- Growth substances - Auxins, gibberellins, cytokinins, abscisic acid, ethylene, brassinosteroids - physiological effect and mechanism of action in agricultural and horticultural crops –Photoperiodism – Classification of plants and mechanism of flowering – Phytochrome and their action on flowering – Vernalization- Mechanism and its practical application, biological rhythms and movements. Seed dormancy and causes and Seed germination and their biochemical changes.

UNIT V **(12 hrs)**

Plant senescence –Types and Mechanism of senescence- Abscission: Morphological and biochemical changes – Significance. Fruit ripening-

Biochemical, Physiological changes and control of fruit ripening. Plant response to environmental stress: Biotic and Abiotic stress – Water, temperature, light and salinity- Adaptive mechanism to various stresses (avoidance, escape, tolerance)– stress responsive proteins – anti-oxidative mechanism.

TEXTBOOKS

1. Gauch, H.G. *Inorganic Plant Nutrition.* Hutchinson & Dowd. New York, 1972.
2. Govindji. *Photosynthesis. AP.* New York, 1982.
3. Jacob, W.P. *Plant Hormones and Plant Development*. Cambridge University Press. Cambrigde, 1979.
4. Khan, A.A. *The Physiology and Biochemistry of Seed development*, Dormancy and Germination. Elesiver. Amsterdam, 1982.
5. Salisbury, F. B.C.W. Ross. *Plant Physiology*. Wassworth Pub. Co. Belmont, 1991
6. Ting, I.P. *Plant Physiology*. Addison Wesley Pb. Philippines, 1982.
7. Sage, R and R.K. Monson (eds). *The Biology of C4 Plants* AP New York, 1999.

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1. Bidwell, R.G.S. *Plant Physiology*, Macmillan Publisher, Boston, 1974.
2. Devlin, R.M. *Plant Physiology,* PWS publisher, Boston, 1996.
3. Jain, V.K. *Fundamentals of Plant Physiology*. Chand & Company Ltd., New Delhi, 2017.
4. Gontia. *A textbook of Plant Physiology*. Satish Serial publishing House, New Delhi, 2016.
5. Leopold, A.C, *Plant Growth and Development*, McGraw Hill, New York, 1994.
6. Lincoln Taiz *et al*., *Plant Physiology and Development*. Sinauver Associates Inc. Publishers, Sunderland, Massachusetts, 2014.

Web Sources

1. https://www.sciencedirect.com/topics/agriculture-and0biological-sciences/plant-physiology.
2. https://learn.careers360.com/biology/plant-physiology-chapter/
3. https://www.biologydiscussion.com/plants/plant-physiology/top-6-processes-of- plant- physiology/24154.
4. https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf
5. https://basicbiology.net/plants/physiology
6. https://learn.careers360.com/biology/plant-physiology-chapter/4
7. https://swayam.gov.in/nd2_cec20_bt01/preview
8. https://www.nature.com/subjects/plant-physiology

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE –XIV: BIOCHEMISTRY & APPLIED BIOTECHNOLOGY
(23PBYC42)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To study the fundamentals and significance of Plant Biochemistry.
- To know the structure and properties of plant biomolecules.
- To learn the fundamental and applications of Plant Biotechnology.
- To study the mechanism of enzyme action and inhibition.
- To expose the students on the fundaments of genetic transformation.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the fundamentals and significance of Plant Biochemistry
CO2[K2]: illustrate the structure and properties of plant biomolecules
CO3[K3]: explain the role of enzymes in plants
CO4[K4]: compare the metabolism and modify accordingly
CO5[K5]: discuss the skills for effective utilization of microbial/plant enzymes.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	1	2	2	-	-	-
CO2[K2]	3	2	2	1	2	-	-
CO3[K3]	3	3	2	2	2	1	3
CO4[K4]	2	2	1	3	2	1	1
CO5[K5]	1	2	2	2	2	1	2
Weightage of the course	12	10	9	10	8	3	6
Weighted percentage of Course contribution to POs	**3.05**	**2.82**	**2.78**	**3.26**	**2.9**	**1.16**	**2.36**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Atomic structure: chemical bonds - ionic bond, covalent bond, coordinate covalent bond, hydrogen bond, hydrogen ion concentration (pH), buffers. Thermodynamics principle, First Law of Thermodynamics a) energy (b) Enthalpy (ii) second law of thermodynamics (a) Spontaneity and disorder (b) entropy (c) free energy, redox potential, dissociation and association constant, activation energy, binding energy

UNIT II **(12 hrs)**

Photosynthesis: Physical nature of light – absorption and fate of light energy – absorption and action spectra- photoreceptors- Ultra structure and biochemical compartmentation of Chloroplast; Biomolecules and Enzymes: Classification of carbohydrates; Structure and properties of monosaccharides, Oligosaccharides, Polysaccharides – Glycoproteins. Protein and Amino acids: Structure, Classification and properties; Peptides: Primary, secondary, Ramachandran plot, tertiary and quaternary structures. Classification of Lipids: Structure and properties of fatty acids, phospholipids, glycolipids, lipoproteins, cholesterol - structure and functions.

UNIT III **(12 hrs)**

Enzymes- Classification and nomenclature chemical nature of enzymes – factors affecting enzyme action – Michaelis – Menton constant, MM equation, Lineweaver Burk plot, Enzyme inhibition, co enzymes- mechanism of enzyme action, isoenzymes. Secondary Metabolites: Structure, classification and properties of alkaloids, steroids, terpenoids, flavonoids. Glycosides - chemical nature and role.

UNIT IV **(12 hrs)**

Transgenic plants - pest resistance, herbicidal resistance, Disease resistant, abiotic and biotic stress tolerant, in improving crop yield, food quality-Golden rice, Edible vaccines, Virus and Bacteria based transient gene expression systems. Virus induced gene complementation, Virus State Integrated Board of Studies – Botany PG 42 induced gene silencing. Cytoplasmic male sterility and fertility restoration, terminator Seed technology, antisense technology for Delayed fruit ripening, Plants as factories for useful products and pharmaceuticals

UNIT V **(12 hrs)**

Screening of Biotransformants - Fermentation techniques- Types. Industrial Production of enzymes-amylase, protease & lipase and their applications. Immobilization for enzymes production. Antibiotic Penicillin production. Amino acid - Glutamic acid production. Production of Alcohol and Xanthan Gum. Bioreactors for culturing Plant cells and production of Secondary

metabolites, Super bug and its role in biodegradation. Bioremediation - *In situ* and *Ex situ*

TEXTBOOKS

1. Satyanarayana, U and Chakrapani, U. *Biochemistry, Books and Allied* (P) Ltd. Calcutta,2005.
2. A.L.Lehninger, D.L.Nelson & M.M.Cox. *Principles of Biochemistry.* Worth Publishers, New York, 1993.
3. Stryer, L. *Biochemistry.* Freeman & Co, New York, 1994.
4. Zubay, G. *Biochemistry.* 1988 Macmillan Publishing Co, New York, 1988.
5. Harold, F.M. *The vital force: A study of Bioenergetics*. Freeman & Co, New York, 1986.
6. Jain, J.L. *Fundamentals of Biochemistry*. S. Chand & Co. New Delhi, 2005.
7. Lehninger, A.L. *Principles of biochemistry*, CBS Publication. Halford, N, 2015. Plant Biotechnology: Current and Future Applications of Genetically Modified crops, John Wiley and Sons, 1982.
8. Kumar, Pradeep. *Advances in Microbial Biotechnology: Current Trends and Future Prospects.* 10.1201/9781351248914, 2018.

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Books

1. Bonner, J. and Warner, W.H. *Plant Biochemistry*. Academic Press. Inv. New York, 1961.
2. Gupta, S.N. *Biochemistry* Rastogi Publications, Meerut, 2016.
3. Satyanarayana, U. and Chakkrapani, U. *Biochemistry.* Elsevier India Pvt Ltd & Books Allied Pvt.Ltd, New Delhi, 2013.
4. Nelson, D.L. and Cox, M.M. *Lehninger's Principles of Biochemistry*, Prentice Hall, International N.J, 7th Edition, 2017.
5. Heldt, H-W. *Plant Biochemistry*, 3rd Edition. Elsevier Academic Press, 2005.
6. Buchanan, B.B., Grissem, W. and Jones, R.L. *Biochemistry and molecular biology of plants.* 5th Edition. Wiley-Blackwell, 2000.
7. Jain, J.L., Jain, S. and Jain, N. *Fundamentals of Biochemistry*. Chand Publishing, New Delhi, 2016.
8. Chawla, H.S. *Introduction to Biotechnology,* 2nd edn. Oxford IBH, ISBN:978-81-204-1732-8, 2009.

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1. http://priede.bf.lu.lv/grozs/AuguFiziologijas/Augu_biokimija/Plant%20Biochemistry 204.pdf
2. http://www.brainkart.com/subject/Plant-Biochemistry_257/
3. https://swayam.gov.in/nd2_cec20_bt12/preview
4. https://www.biorxiv.org/content/10.1101/660639v2
5. https://www.scribd.com/document/378882955/
6. https://nptel.ac.in/courses/102/107/102107075/
7. https://plantae.org/plant-physiology-top-articles-of-2020-based-on-altmetric-scores/
8. https://.britannica.com/technology/biotechnolog/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE - XIV: PRACTICAL: PLANT PHYSIOLOGY AND PLANT METABOLISM AND BIOCHEMISTRY AND APPLIED BIOTECHNOLOGY (23PBYC4P)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 6 **INT. MARKS : 25**
CREDITS : 4 **EXT. MARKS : 75**
DURATION : 90 hrs **MAX. MARKS : 100**

Course Objectives

- To extract biomolecule of diverse nature from different sources material.
- To recognize the role that water plays in physiological processes in plants.
- To learn the fundamental and applications of Plant Biotechnology.
- To learn about chromatographic techniques.
- To expose the students to gain recent advances in molecular biology.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: indicate the presence of macro molecules in the plant cell
CO2[K3]: indicate the role of pigment in photosynthetic mechanism of plants
CO3[K4]: examine the fundamentals of water and its relation to plants
CO4[K5]: analyze the structure and properties of various enzymes
CO5[K6]: evaluate the theory and practical skills gained during the course.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	1	2	1	1	-
CO2[K3]	2	1	3	-	2	1	1
CO3[K4]	3	2	2	1	2	2	1
CO4[K5]	2	3	2	2	2	1	-
CO5[K6]	3	3	2	2	1	2	1
Weightage of the course	13	12	10	7	8	7	3
Weighted percentage of Course contribution to POs	**3.31**	**3.39**	**3.09**	**2.28**	**2.9**	**2.7**	**1.18**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(18hrs)**

PLANT PHYSIOLOGY

1. Determination of osmotic potential by plasmolytic method.
2. Determination of water potential using gravimetric method.
3. Determination of water potential using dye method (Chardakov's method).
4. Effect of Monochromatic light on apparent photosynthesis.
5. Effect of CO_2 concentration on apparent photosynthesis.

UNIT II **(18 hrs)**

PLANT PHYSIOLOGY

1. Effect of temperature on protoplasmic membrane.
2. Separation of chloroplast pigments using paper chromatographic technique.
3. Estimation of chlorophyll content using Arnon's method.
4. Determination of rate of photosynthesis using O_2 electrode.
5. Experiment to study the rate of Hill activity of isolated chloroplast by dye-reduction.

UNIT III **(18 hrs)**

BIOCHEMISTRY

1. Rice coleoptile growth test for Indole Acetic Acid.
2. Effect of auxin on root initiation.
3. Experiments to show the heribicidal action of Auxin (2-4,D).
4. Effect of synthetic Cytokinin on the destruction of chlorophyll.

UNIT IV **(18 hrs)**

BIOCHEMISTRY

1. Estimation of Proline content.
2. Estimation of Glycine betaine content.
3. Determination of Relative Water Content**.**

UNIT V **(18 hrs)**

APPLIED BIOTECHNOLOGY

1. Isolation of genomic DNA.
2. Electrophoresis of nucleic acid.
3. Preparation of competent E.Coli cells.
4. Transformation and recovery of plasmid clones.

TEXTBOOKS

1 Plummer, D. *An introduction to Practical Biochemistry*, Tata McGraw–Hill Publishing Company Ltd., New Delhi, 1988.

2 Palanivelu, P. *Laboratory Manual for analytical biochemistry and separation techniques*, School of Biotechnology, Madurai Kamaraj University, Madurai, 2004.

3. Jayaraman.J. *Laboratory Manual in Biochemistry*. Whiley Eastern Limited,New Delhi, 1981.
4. Bendre, A.M. and Ashok Kumar. *A text book of practical Botany*. Vol. I & II. Rastogi Publication. Meerut. 9th Edition, 2009.
5. Manju Bala, Sunita Gupta, Gupta NK. *Practicals in Plant Physiology and Biochemistry.* Scientific Publisher, 2012.
6. Joy, P.P., Surya, S and Aswathy, C. *Laboratory Manual of Biochemistry*, Agricultural University, Pineapple Research Station, Ernakulam, Kerala, 2015.
7. Poonam Sharma – Natu, Vijay Paul and P.S. Deshmukh. *Laboratory manual Experimental Plant Physiology. Division of Plant Physiology*, Indian Agricultural Research Institute, New Delhi,2021.
8. George M Malacinski. *Freifelders Essentials of Molecular Biology* (4th ed.) Jones & Bartlett, 2015.

REFERENCES

Books

1. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. *Practicals in plant physiology and biochemistry*. Scientific Publishers (India), 2013.
2. Wilson, K and J. Walker (Eds). *Principles and Techniques of Practical Biochemistry* (4th Edition) Cambridge University Press, Cambridge, 1994.
3. Bendre, A.M and Ashok Kumar. *A text book of practical Botany*. Vol. I & II. Rastogi Publication. Meerut. 9th Edition, 2009.
4. Manju Bala, Sunita Gupta, Gupta, N.K. *Practicals in Plant Physiology and Biochemistry*. Scientific Publisher, 2012.
5. Wilson, K and J. Walker. *Principles and Techniques of Practical Biochemistry*, 5thEdition. Cambridge University press, New York, 2005.
6. Rodney Boyer. *Modern Experimental Biochemistry*, 3rd Edition. Published by Addison Wesley Longman. Singapore, 2000.
7. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. *Practicals in plant physiology and biochemistry*. Scientific Publishers (India), 2013.
8. Manju Bala, Sunita Gupta, Gupta, N.K. *Practicals in Plant Physiology and Biochemistry*. Scientific Publisher, 2012.

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2. https://kau.in/document/laboratory-manual-biochemistry
3. https://www.amazon.in/Practical-Manual-on-Plant-Biochemistry/dp/6200539790
4. https://www.amazon.in/Laboratory-Manual-Physiology-Mukesh-Amaregouda/dp/6133993502
5. https://www.kopykitab.com/A-Laboratory-Manual-of-Plant-Physiology-Biochemistry-and-Ecology-by-Akhtar-Inam
6. https://www.kopykitab.com/Cell-And-Molecular-Biology-A-Lab-Manual-by-K-V-Chaitanya

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE –XVI: PROJECT WITH VIVA-VOCE (23PBYJ41)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 8 **INT. MARKS : 25**
CREDITS : 7 **EXT. MARKS : 75**
DURATION : 120 hrs **MAX. MARKS : 100**

Course Objectives

- To familiarize the students with the objectives and stages in formulating a Research Project.
- To enable the learners to identify the different stages of Research Methodology.
- To adhere to the rules formulated in the latest edition of MLA hand book.
- To employ the accurate documentation in executing Research project.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: identify the unexplored areas of research
CO2[K2]: outline the objectives in formulating a research paper
CO3[K3]: apply the latest rules of documentation to cite Print, Non-print and Web Publications in a research paper
CO4[K4]: analyze the stages in writing a thesis – collecting and evaluating Sources and drafting documentation
CO5[K6]: prepare a rightly documented research project with adequate discussion, interpretation and evaluation

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	2	1	1	1
CO2[K2]	3	2	2	2	1	1	1
CO3[K3]	3	2	2	2	1	1	1
CO4[K4]	3	2	3	3	1	1	1
CO5[K6]	2	2	3	3	2	1	1
Weightage of the course	14	10	11	12	6	5	5
Weighted percentage of Course contribution to POs	**3.57**	**2.85**	**3.41**	**3.82**	**2.17**	**1.93**	**1.97**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Guidelines

1. Students are required to submit a project at the end of the IV semester. The student will work under a faculty member as the research guide.
2. Depending on the interest of the students, project research areas will be chosen.
3. Students must meet the guide periodically.
4. The project carries 100 marks of which 25 Marks for Internal Assessment and 75 Marks for External Examination.
5. There will be two project review sessions.
6. Each student must either present paper or participate in Conferences/Seminars related to his Project work.
7. A draft of the final project report should be submitted to the Project Guide for review at least three weeks prior to the end of the semester.
8. The project report should be of minimum 40 pages (excluding bibliography &appendices)
9. Three copies of the final project report should be submitted.
10. The Head of the department and the Project Guide will evaluate the final Project Report.
11. The viva voce board shall consist of the External Examiner, the Head of the Department and the Internal Examiner (Research Project Guide)

The following rubrics will be taken into account for the evaluation of Project work and viva-voce:

Internal Assessment (25 Marks)		**External Examination (75 Marks)**	
Project Report & Review	: 15 Marks	Project Report	: 25 Marks
PowerPoint Presentation	: 5 Marks	Viva Voce	: 50 Marks
Participation/Publications in Conferences or Seminars	: 5 Marks		

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - VI: ORGANIC FARMING
(23PBYO41)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS: 25**
CREDITS : 3 **EXT. MARKS: 75**
DURATION : 60 hrs **MAX. MARKS: 100**

Course Objectives

- To study various aspects of organic farming.
- To understand the relevance of organic farming, its advantages.
- To know the importance of organic farming in the present scenario.
- To awareness on the importance of organic farming in the present scenario and its impact on environment and soil health.
- To expose the students to about quality aspect and grading.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: summarize the various aspects of organic farming
CO2[K2]: describe the relevance of organic farming, its advantages
CO3[K3]: explain the short comings against conventional high input agriculture
CO4[K4]: compare the packaging methods of harvest
CO5[K5]: discuss and develop skills for post harvest management.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	2	2	2	2
CO2[K2]	2	3	1	2	3	2	2
CO3[K3]	2	3	1	-	2	1	3
CO4[K4]	2	2	1	1	1	3	2
CO5[K5]	2	2	2	2	2	2	2
Weightage of the course	11	14	7	7	10	10	11
Weighted percentage of Course contribution to POs	**2.81**	**3.95**	**2.18**	**2.23**	**3.57**	**3.79**	**4.23**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

AGRONOMY: Organic farming- concept, characteristics, significance, organic ecosystem, scope of organic farming in India - Principles and types of organic farming. Choice of crops & varieties in organic farming - Initiative by Govt/NGOs/Other organizations for promotion of organic farming Operational structure of NPOP (National Programme for Organic Production) - Concept of dryland agronomy Organic nutrient resources & their fortification, restriction to nutrient use in organic farming - Organic production methods for cereals, vegetables and fruit crops.

UNIT II **(12 hrs)**

SOIL SCIENCE: Organic farming for sustainable agriculture; Manures-compost, methods of composting - Green manuring, vermicompost and biofertilizer. Harmful effect of non-judicious chemical fertilization - Organic farming practices for improving soil health. Quality parameters of organic manures and specifications - Soil fertility in organic farming systems. Manure preparation methodology - Soil improvement.

UNIT III **(12 hrs)**

FUNDAMENTAL OF ORGANIC FARM MANAGEMENT: Land management in organic farming - Water management in organic farming. Organic insect disease management - Organic pest disease management. Preventive and cultural methods for insects and pest control - Identification of different fungal and bacterial biocontrol agents Indigenous technical knowledge for insects-pest, disease - Weed and nutrient management in organic farming.

UNIT IV **(12 hrs)**

POST HARVEST MANAGEMENT: Processing, labeling of organic produce - Storage and transport of organic produce. Marketing trends in Organic farm products.

UNIT V **(12 hrs)**

ORGANIC QUALITY CONTROL STANDARDS: Certification- types, process & procedure and agencies. Quality aspect and grading - Packaging and handling. Economic considerations and viability of organic products - Export of organic product and marketing.

TEXTBOOKS

1. NIIR Board. *The complete Technology Book on Biofertilizer and organic farming.* 2nd Edition. NIIR Project Consultancy Services, 2012.
2. Sathe, T.V. *Vermiculture and Organic Farming.* Daya publishers, 2004.
3. Subba Rao N.S. *Biofertilizers in Agriculture and Forestry.* Fourth Edition. Medtech, 2017.

4. Vayas,S.C, Vayas, S. and Modi, *H.A. Bio-fertilizers and organic Farming Akta Prakashan*, Nadiad, 1998.
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2. Tolanur, S. *Fundamentals of Soil Science* IIndEdition , CBS Publishers , New Delhi, 2018.
3. Reddy, S.R. *Principles of Organic Farming* Kalyani Publishers , New Delhi, 2017.
4. Dongarjal, R.P and Zade, S.B*. Insect Ecology and Integrated Pest Management* Akinik Publications, New Delhi, 2019.
5. Ahmad Mehraban. The Basis of Organic Fertilizers, LAP LAMBERT Academic Publishing, 2013.

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3. https://www.elsevier.com/books/organic-farming/chandran/978-0-12-813272-2
4. https://link.springer.com/book/10.1007/978-3-030-04657-6
5. https://www.afrimash.com/product-category/livestock-section/book/organic-farming-ebooks/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - VI: FORESTRY AND WOOD TECHNOLOGY (23PBYO42)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To study various aspects of Forest Botany.
- To understand the importance and different forests and plants species.
- To know the ecological significance of forests.
- To enable the students to information on forests laws.
- To raise student awareness of the need to create a sustainable way of living and the current Global issues with forestry caused by human interference.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: explain the various aspects of Forest Botany
CO2[K2]: describe the importance and of different forests
CO3[K3]: intrepret the ecological significance of forests
CO4[K4]: analyze the dynamics of the forest
CO5[K5]: discuss the various Indian forests laws and acts.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	2	2	2	2
CO2[K2]	2	3	1	2	3	2	2
CO3[K3]	2	3	1	-	2	1	3
CO4[K4]	2	2	1	1	1	3	2
CO5[K5]	2	2	2	2	2	2	2
Weightage of the course	11	14	7	7	10	10	11
Weighted percentage of Course contribution to POs	**2.81**	**3.95**	**2.18**	**2.23**	**3.57**	**3.79**	**4.23**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Introduction and scope of Forest Botany - Merits of combining traditional Botany and Forestry practices. General introduction to forests, natural and manmade. Types of forests tropical, temperate, evergreen, semi evergreen, deciduous, monoculture, multipurpose, social and industrial. Forest and climate - Forest and Biodiversity - Forest and gene conservation - Forest and ecosystem - Forest and civilization. Geographical history of the forest vegetation - natural vs. artificial. Special emphasizes on social forestry, Industrial forestry and Multi-purpose forestry. Preservation of natural forestry - Pollution control.

UNIT II **(12 hrs)**

Forest genetics, Forest physiology, forest ecology – strong interrelationships. Macro-dynamic ecosystem reserves, hydrological cycles, balance. Identification of timber plants based on vegetative features. Seedlings, leaves, bark branching pattern architectural models of trees. Major and minor forest products, use and misuse of forests by man, direct and indirect forest wealth, forest policies, forest protection through peoples committee.

UNIT III **(12 hrs)**

Silviculture: concept and scope of study, forest in general form, composition, classification of world forests and Indian forests. Classification based on its quality density, tolerance, crown; water cycles of forest. Photosynthetic processes in forest: nitrogen and mineral nutrition in forests.

UNIT IV **(12 hrs)**

Seed dynamics in forest: seed production, dissemination, germination, establishment and mortality, growth of trees in general terms – height, diameter, volume, growth of stands – gross increment, net increment, stand reaction to varies types of cuttings.

UNIT V **(12 hrs)**

Measurement: definition, direct measurements, direct and indirect estimate, and prediction. Measurement of diameter – rules and methods, measurement of height – different rules, methods, instruments, total height and merchantable length. Measurement of volume – common units, different methods and procedures of volume measurements. Measurement of age: direct estimate, averages, standard error, and sampling, General concept of indirect estimate based on one or more independent variables. Forestry for social and national development. Progress to be achieved in social forestry, industrial forestry and multiple forestry. Forest Laws- Indian Forest Act, 1927; Forest conservation Act. Wild Life Protection Act, 1972.

TEXTBOOKS

1. Manikandan, K and S. Prabhu. *Indian forestry, a breakthrough approach to forest service.* Jain Bros, 2013.
2. Roger Sands. *Forestry in a global context*, CAB international, 2013.
3. Balakathiresan. S. *Essentials of Forest Management*. Natraj Publishers, Dehradun, 1986.
4. Agarwala, V.P. *Forests in India, Environmental and Protection Frontiers.* Oxford & IBH Publishing Co. New Delhi, 1990.
5. Chundawat, B.S. and Gautham, S.K. *Text book of Agro forestry.* Oxford and IBH publisher, New Delhi, 1996.
6. Singhi, G.B. *Forest Ecology of India,* Publisher: Rawat, 1987.
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2. West, P.W. *Tree and forest measurement*, Springer international publishing Switzerland, 2015
3. Kollmann, F.F.P and Cote, W.A. *Wood science and Technology*. Vol. I & II Springer Verlag, New York, 1988.
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5. https://academic.oop.com
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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - VI: GENE CLONING AND GENE THERAPY (23PBYO43)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To give a clear knowledge of genetic engineering, cloning vectors.
- To understand the procedure involved in recombinant DNA technology.
- To focus on the application of gene cloning in plants and animals.
- To enable the students to information on Gene Therapy.
- To raise student to create transgenic plants for hybrid seed production.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: recall the basic concepts of gene cloning
CO2[K2]: examine and to identify the selection of clones
CO3[K3]: compare and understand the concept of gene therapy
CO4[K4]: explain the transgenic plants
CO5[K5]: discuss and develop skills for hybrid seed production and molecular farming.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	2	2	2	2
CO2[K2]	2	3	1	2	3	2	2
CO3[K3]	2	3	1	-	2	1	3
CO4[K4]	2	2	1	1	1	3	2
CO5[K5]	2	2	2	2	2	2	2
Weightage of the course	11	14	7	7	10	10	11
Weighted percentage of Course contribution to POs	**2.81**	**3.95**	**2.18**	**2.23**	**3.57**	**3.79**	**4.23**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Definition of genetic engineering, gene cloning and recombinant DNA cloning vectors: plasmids, bacteriophages, plant and animal vectors.

UNIT II **(12 hrs)**

Gene cloning in prokaryotes and eukaryotes, Isolation of DNA to be cloned, insertion of DNA fragment into vector. Use of Restriction Linkers: use of Homopolyer tails, Transfer of recombinant DNA into Bacteria cell. Selection of clones.

UNIT III **(12 hrs)**

Gene Therapy: Definition, Germ cell and Somatic cell. Amniocentesis in human; patient therapy, embryo therapy.

UNIT IV **(12 hrs)**

Restriction mapping –. Random amplified polymorphic DNA using PCR. DNA finger printing; Gene Tagging. Physical methods of gene delivery. Gene transfer techniques. Genetic counselling – Eugenics, Euthenics.

UNIT V **(12 hrs)**

Transgenic plants with herbicide resistance, insect resistance, virus resistance andresistance against bacterial and fungal pathogens. Transgenic plants for hybrid seed production and molecular farming.

TEXTBOOKS

1. Das, H.K. *Textbook of Biotechnology* (4th edition). Wiley India Pvt. Ltd. New Delhi, 2010.
2. Gamborg, O.L and G.C. Phillips (eds). *Plants, genes and agriculture*. Jones and Bartlett Publishers, 1995.
3. Verma, P.S and Agarwal V.K. *Genetic Engineering*. S.Chand & Co. Ltd. New Delhi, 2009.
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5. Ramavat, K.G. *Plant Biotechnology.* S. Chand and Co. Ltd., New Delhi, 2006.
6. Chawla, H.S. *Introduction to Biotechnology*. 2nd edn. Oxford IBH, ISBN: 978-81-204- 1732-8. 2009.
7. Halford, N. *Plant Biotechnology: Current and Future Applications of Genetically Modified crops,* John Wiley and Sons, 2015.
8. Kumar, Pradeep. *Advances in Microbial Biotechnology*: Current Trends and Future Prospects. 10.1201/9781351248914, 2018
9. Thieman. *Introduction to Biotechnology* 3rd Edition. Pearson Education India, 2014.
10. Khan. I.A. and A. Khanum . *Fundamentals of Biotechnology – Forensic Science Genetic Engineering*. Ukaaz publication, Hyderabad, 2004.
11. Gupta. P.K. *Elements of Biotechnology*. Rastogi publications, Meerut, 1998.

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2. Slater, A. Scott, N and Fowler, M. *Plant Biotechnology: The Genetic Manipulation of Plants.* Oxford University Press Inc, 2008.
3. Reynolds, P.H.S. *Inducible Gene Expression in Plants*. CABI Publishing, U.K, 1999.
4. Chawla, H.S. *Introduction to Biotechnology*, 2nd edn. Oxford IBH, ISBN:978-81-204-1732-8, 2009.
5. Halford, N. *Plant Biotechnology: Current and Future Applications of Genetically Modified Crops*, John Wiley and Sons, 2015.
6. Brown T.A. *Gene Cloning and DNA Analysis*- An Introduction (4th edition). Blackwell Science. Oxford, 2001.
7. Clark, D.P and Pazdernik, N.J. *Biotechnology- Applying the Genetic Revolution.* Elsevier Academic Press. USA, 2009.
8. Glick B.R and J. J. Pasternak. *Molecular Biotechnology*, Panima Publication Co., 2009.
9. Harisha, S. *Biotechnology Procedures and Experiments Handbook*. Infinity Science Press Llc. Hingham. MA, 2007.
10. Mosier N.S and Ladisch M.R. *Modern Biotechnology- Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals*. John Wiley & Sons Inc. New Jersey, 2009.
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12. Ignacimuthu, S. *Applied Plant Biotechnology*. Tata Mc Graw Hill, publishing company Ltd., New Delhi, 1998.
13. Neal Stewart, Jr. *Plant Biotechnology and Genetics: Principles, Techniques and Applications*. JohnWiley & sons Inc, 2008.

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2. https://www.amazon.in/Gene-Cloning-Steve-Minchin-ebook/dp/B000SHTUT2
3. https://www.futuremedicine.com/doi/book/10.2217/9781780842134
4. https://www.researchgate.net/publication/51144570_Introduction_to_Gene_Therapy_A_Clinical_Aftermath
5. https://link.springer.com/book/10.1007/978-88-470-1643-9

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
ELECTIVE COURSES GENERIC/ DISCIPLINE SPECIFIC - VI: FARM SCIENCES-GREEN WEALTH (23PBYO44)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 25**
CREDITS : 3 **EXT. MARKS : 75**
DURATION : 60 hrs **MAX. MARKS : 100**

Course Objectives

- To understand the concept of agronomy and sustainable agriculture.
- To evaluate the importance of crop management technology.
- To develop their understanding on the concept of fertilizers.
- To develop the better crop production by using fertilizers.
- To develop the skills for cultivation of plants and their values.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: list out the importance of agronomy and its scope
CO2[K2]: express the practical knowledge in weed management principles
CO3[K3]: explain the methods of herbicide and fertilizer application
CO4[K4]: compare and contrast the yield estimation and water management
CO5[K5]: discuss and develop skills for effective conservation, harvesting and storage methods.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	2	2	2	2
CO2[K2]	2	3	1	2	3	2	2
CO3[K3]	2	3	1	-	2	1	3
CO4[K4]	2	2	1	1	1	3	2
CO5[K5]	2	2	2	2	2	2	2
Weightage of the course	11	14	7	7	10	10	11
Weighted percentage of Course contribution to POs	**2.81**	**3.95**	**2.18**	**2.23**	**3.57**	**3.79**	**4.23**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging. Efficient utilization of water through soil and crop management practices. ,Management of crops in rain fed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

UNIT II **(12 hrs)**

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

UNIT III **(12 hrs)**

Identification of crops, seeds, fertilizers, pesticides and tillage implements, Effect of sowing depth on germination and seedling vigor, Identification of weeds in crops, Methods of herbicide and fertilizer application.

UNIT IV **(12 hrs)**

Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements- reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, particle density, bulk density and infiltration rate, Measurement of irrigation water.

UNIT V **(12 hrs)**

Harvesting, storage, physiological disorders of important vegetable crops like solanaceous fruit vegetables (brinjal, tomato &chilli), tuber crops (Potato), cucurbits (pumpkin, cucumber, watermelon & gourds), pod vegetables (pea & bean), cole crops (cabbage & cauliflower), bulb crops (onion, garlic), root crops (radish & carrot), common leafy vegetables, spices: turmeric and ginger, black pepper and cardamom.

TEXTBOOKS

1. Reddy, T.Y and G.H. Sankar Reddi. *Principles of Agronomy*. Kalyani Publishers, 2015.
2. Reddy, S.R. *Principles of Agronomy*. Kalyani Publishers, 2016.

3. Brady, N.C and Weil, R.R. *The Nature and Properties of Soils* - Weil, Prentice Hall Inc, 1996.
4. Craig, C. Sheaffer and Kristine, M. Moncada. *Introduction to Agronomy-Food crops and Environment* (Second Edition), 2012.
5. George Acquaah. *Principles of Crop production: Theory, Techniques, and Technology*. Pearson education, 2004.

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1. Yawalkar, K.S. Agarwal, J. P and S. Bokde. *Manures and fertilizers – AgriHorticultural* Publication House, 1967.
2. Russell, J.E. *Soil Conditions and Plants Growth* - Daya Books, 2002.
3. Hansen, V. E. Israelsen, O.W and G. E. Stringham. *Irrigation Principles and Practices* -, New York Wiley. 1980.
4. Reddy, S.R. *Principles of Agronomy*. Kalyani Publishers, 2017.
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2. https://www.kobo.com/us/en/ebook/green-wealth
3. https://nishat2013.files.wordpress.com/2013/11/agronomy-book.pdf
4. https://www.kobo.com/in/en/ebook/weed-2
5. https://www.amazon.in/Handbook-Fertilizers-Sources-Make-Up-Effects-ebook/dp/B00D45LHAK

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
SKILL ENHANCEMENT COURSE - IV: PROFESSIONAL COMPETENCY COURSE
BOTANY FOR NET/UGC-CSIR/SET/TRB COMPETITIVE EXAMINATIONS /GENERAL STUDIES FOR UPSC/TNPSC/OTHER COMPETITIVE EXAMINATIONS (23PBYS41)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 100**
CREDITS : 2
DURATION : 60 hrs

Course Objectives

- To understand the concept of agronomy and sustainable agriculture.
- To gain knowledge about the cell, organelles and physiology.
- To understand the biodiversity DNA recombination technology.
- To recognize principles of prokaryotic and eukaryotic cells.
- To understand the mechanism the shift from vegetative to reproductive phase.

Course Outcomes (CO)

On successful completion of the course, the learners will be able
CO1[K1]: recall the structure of atoms, molecules, and chemical bonds
CO2[K2]: reunite the knowledge in cell biology and molecular biology
CO3[K3]: explain the methods of recombinant technology
CO4[K4]: compare and contrast the physiological functions and metabolism
CO5[K5]: discuss the skills for effective comprehension and communication.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	1	3	2	1	2
CO2[K2]	3	3	2	2	3	2	1
CO3[K3]	2	2	3	3	1	1	1
CO4[K4]	3	3	3	3	3	-	2
CO5[K5]	3	3	2	2	3	1	1
Weightage of the course	14	14	11	13	12	5	7
Weighted percentage of Course contribution to POs	**3.58**	**3.92**	**3.44**	**4.09**	**4.23**	**1.91**	**2.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY: Structure of atoms, molecules, and chemical bonds. Composition, structure, and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids, and vitamins). Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes. Conformation of proteins (Ramachandran plot, secondary structure, domains, motif, and folds).Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).Stability of proteins and nucleic acids. Metabolism of carbohydrates, lipids, amino acids nucleotides, and vitamins.

UNIT II **(12 hrs)**

CELLULAR ORGANIZATION: Membrane structure and function: structure of model membrane, lipid bilayer, and membrane protein diffusion, osmosis; ion channels; active transport; membrane pumps; mechanism of sorting and regulation of intracellular transport; electrical properties of membranes.

Structural organization and function of intracellular organelles (cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of the cytoskeleton and its role in motility).

Organization of genes and chromosomes: Operon, unique and repetitive DNA, interrupted genes, gene families, the structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons).Cell division and the cell cycle: mitosis and meiosis, their regulation, steps in the cell cycle, regulation, and control of the cell cycle. Microbial Physiology: Growth yield and characteristics, strategies of cell division, stress response.

UNIT III **(12 hrs)**

FUNDAMENTAL PROCESSES: DNA replication, repair, and recombination: Unit of replication, enzymes involved, replication origin and replication fork, the fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination.

RNA synthesis and processing: Transcription factors and machinery, a formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure, and function of different types of RNA, RNA transport).

Protein synthesis and processing: Ribosome, the formation of initiation complex, initiation factors and their regulation, elongation and elongation

factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proofreading, translational inhibitors, Post-translational modification of proteins).

Control of gene expression at transcription and translation level: Regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, the role of chromatin in gene expression and gene silencing)

UNIT IV **(12 hrs)**

CELL COMMUNICATION AND CELL SIGNALING: Host-parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.

Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, light signaling in plants, bacterial chemotaxis, and quorum sensing.

Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.

Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer, and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

Innate and adaptive immune system: Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity, and immunogenicity. B and T cell epitopes, structure, and function of antibody molecules. generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies, vaccines.

UNIT V **(12 hrs)**

DEVELOPMENTAL BIOLOGY

Basic concepts of development: Potency, commitment, specification, induction, competence, determination, and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the

cytoplasmic determinants; imprinting; mutants and transgenics in the analysis of the development.

Gametogenesis, fertilization, and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia, and chick; organogenesis – vulva formation in Caenorhabditis Elegans, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post-embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum Programmed cell death, aging, and senescence

TEXTBOOKS

1. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. *The Embryology of Angiosperms* (6th revised and enlarged edition). Vikas Publishing House, New Delhi. 2015.
2. Maheshwari, P. *Recent Advances in Embryology of Angiosperms*. Intl. Soc. Plant Morphologists, New Delhi. 1963.
3. Roy, S.C and Kumar, K.D.C. *Cell Biology*, New Central Book Agency, Calcutta. 1977.
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2. https://plato.stanford.edu/entries/molecular-biology/
3. https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/bioinformatics
4. https://.britannica.com/technology/biotechnolog/
5. https://nptel.ac.in/courses/102/107/102107075/
6. https://plantae.org/plant-physiology-top-articles-of-2020-based-on-altmetric-scores/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
SKILL ENHANCEMENT COURSE - IV: PROFESSIONAL COMPETENCY COURSE
BOTANY FOR ADVANCED STUDIES (23PBYS42)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 100**
CREDITS : 2
DURATION : 60 hrs

Course Objectives

- To be familiar with the basic concepts and principles of plant systematics.
- To learn the importance of plant anatomy in plant production systems.
- To expose the fundamental of various techniques used in molecular studies.
- To learn about the physiological processes that underlie plant metabolism
- To know the energy production and its utilization in plants.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to system, nutrients and its translocation.

CO1[K1]: illustrate the basic principles of systematic
CO2[K2]: summarize the basic functioning of plant growth and nutritive food value
CO3[K3]: understand the organization of nuclear genome
CO4[K4]: compare the apical *vs* lateral meristems in monocot and dicot plant
CO5[K5]: discuss the process involved in the energy production in plants.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	1	3	2	1	2
CO2[K2]	3	3	2	2	3	2	1
CO3[K3]	2	2	3	3	1	1	1
CO4[K4]	3	3	3	3	3	-	2
CO5[K5]	3	3	2	2	3	1	1
Weightage of the course	14	14	11	13	12	5	7
Weighted percentage of Course contribution to POs	**3.58**	**3.92**	**3.44**	**4.09**	**4.23**	**1.91**	**2.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

MOLECULAR GENETICS

(i) Molecular Biology of gene expression: Brief overview of the Central Dogma and Teminism. Transcription in prokaryotes and eukaryotes. Types and structure of RNA polymerase, Different types of RNA, Regulatory sequences and transcription factors involved. Mechanism: Initiation, elongation and termination. Split genes and RNA splicing in eukaryotes. Translation in prokaryotes and eukaryotes. Salient features, exceptions, tRNA-suppressor mutations. Mechanism of translation: Chain initiation, elongation and termination, proteins involved, factors affecting translation accuracy. Molecular mechanism of mutation, cancer biology, human cytogentics

(ii) Molecular mechanism of Gene Regulation: Regulation in prokaryotes, Regulation in Eukaryotes, Epigenetic mechanisms: methylation and transcriptional inactivation, cosuppression through transcriptional silencing, genome imprinting. RNA processing->alternative splicing, RNA stability, RNA interference. Translational regulation: Gene amplification, mating type interconversion Genomics: Structural genomics, Genetic and physical mapping (RFLP), microsatellite maps, cyotogenetic maps, physical maps, positional cloning, chromosome walks and jumps, Genome sequencing, genome databases, human genome sequencing project. Functional genomics. transcriptome, proteome and metabolome, Microarrays and gene-chips. Comparative genomics. Functional and evolutionary relationships prokaryotes, organelles and eukaryotes, orthologues and paralogues. Metabolomics: Identification and quantification of cellular metabolites in biological samples. Pharmacogenomics and drug designing.

UNIT II **(12 hrs)**

ADVANCED TRENDS IN SYSTEMATICS

i) Basic concepts of:

a) Morphology - History, general morphology, types of data, methods of gathering data,
b) Anatomy - History, general anatomy, types of data, methods of gathering data,
c) Embryology – History, types of data, methods of gathering data;
d) Palynology: History, general palynological characters, types of data, methods of gathering data;
e) Cytology and Cytogenetics: History, general cytological and cytogenetic characters, types of data, methods of gathering data;
f) Ecology, History, general ecology, types of data, methods of gathering data
g) (At least two examples from each section should be studied to substantiate the taxonomic significance)

ii) Chemotaxonomy:

a. History, general chemical and chemotaxonomic characters, types of data, methods of gathering data.

b. Identification of the major classes of the pharmaceutically important secondary metabolites from natural sources 8 (phenolics, steroids, terpenoids glycosides and alkaloids).
c. Applications: Phytochemicals in cosmetics, aromatherapy, disease prevention, biotechnology in the production of phytochemicals. Phytochemical databases

(iii) Molecular trends in Biosystematics

a) Molecules and genomes in plant systematics, techniques used in molecular taxonomy, molecular systematics in crop evolution
b) Serology in relation to plant taxonomy- Methods, role of serology in taxonomy.
c) Cladistics and Phenetics

(iv) Molecular trends in Reproductive Biology:

a) Apomixis – Types, cytogenetic basis and induction of apomixes, applications.
b) Biochemistry and genetics of incompatibility, methods to overcome incompatibility, pollen viability tests, molecular basis of incompatibility
c) Sterility – Male sterility, CMS, GMS, CGMS, temperature sensitive and photosensitive male sterility, transgenic male sterility, female sterility and zygotic sterility.

UNIT III **(12 hrs)**

PLANT PHYSIOLOGY

i. Modern concepts Photosynthesis – Environmental and agricultural relevance; Respiration – Biochemical control of respiration
ii. Photomorphogenesis Phytochrome genes and their expression, control of photo-morphogenic responses. Dose-response relations in photomorphogenesis, light induced chloroplast differentiation, effect of photoreceptors.
iii. Biological clock: Circadian rhythms, rhythm responses to environment, clock mechanism
iv. Photoperiodism General principles, florigen concept
v. Plant growth and development Patterns of growth and differentiation; Gene expression and mutations regulating meristem function, embryogenesis, seedling, root, leaf and flower development. Homeotic genes, ABCD model in Arabidopsis flower, hormonal control of plant tissue development, effect of auxins on root and root formation, gibberellin promoted growth of plants, ethylene and triple response mutants, brassinosteroids and photomorphogenesis.

UNIT IV **(12 hrs)**

PLANT PHYSIOLOGY

i. Enzymes: General account: Importance and properties of enzymes in biological sciences, the classification and nomenclature of enzymes with

examples, Mechanism of enzyme action role of enzyme in chemical action, various factors affecting the enzyme activity

ii. Molecular genetics in plant physiology, Environmental plant physiology, Stress physiology .

UNIT V **(12 hrs)**

ECONOMC BOTANY

Economic importance of Cereals, Tuber Crops, Fibre yielding plants, Plantation Crops, Sugar yielding plants, Narcotics, Vegetables, Oil yielding plants, Pulses and Beverages

TEXTBOOKS

1. Sharma, O.P. *Plant Taxonomy*. (II Edition).The McGraw Hill Companies, 2017.
2. Maheshwari, P. *Recent Advances in Embryology of Angiosperms*. Intl. Soc. Plant Morphologists, New Delhi, 1963.
3. Sharma, P.C. *Text Book of Plant Anatomy.* Arjun Publishing House, New Delhi, 2017.
4. Jain, V.K. *Plant Physiology*, S.Chand & Company Ltd. New Delhi, 2017.
5. Lincoln, T, Eduardo, Z, Ian Max, M, and Angus, M. *Fundamentals of Plant Physiology*. Sinauer Associates Inc., US, 2018.
6. Becker, W.M., Kleinsmith L.J. & Hardin J. *The World of the Cell* (6th edition). Benjamin/Cummings Pub. Co. New York, 2005.
7. Brooker, R. J. *Genetics Analysis and Principles*. Addison Wesley Longman Inc., New York, 1999.
8. Bruce, A. et. al. *Molecular Biology of the Cell*. Garland Publishing. New York, 2002.

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1. Mabberley, J.D. *Mebberley's Plant-Book: A portable dictionary of plants, their classification and uses,* 3rd ed. Cambridge University Press, Cambridge, U.K. 1021pp,. 2014.
2. Pandey.B.P. *Economic Botany*. S. Chand Limited, New Delhi, 1999.
3. Bhojwani, S.S. and Soh, *W.Y. Current trends in the embryology of angiosperms*. Springer Science & Business Media, Germany, 2013.
4. Cutler, D. F., Botha, T and Stevenson, D.W. *Plant Anatomy: An Applied Approach*. Blackwell Publishing, Malden, USA. , 2008
5. Steward, F.C. *Plant Physiology* Academic Press, US, 2012
6. Hopkins, W.G and Huner, N.P. *Introduction to Plant Physiology* (4th ed.). John Wiley & Sons. U.S.A., 2009.
7. Noggle G.R and G.J. Fritz. *Introductory Plant Physiology*. Prentice Hall of India, New Delhi, 2002.
8. Anthony J . F. G . *An Introduction to Genetic Analysis*. W. H. Freeman &Co. New York, 2000.
9. Hartl, .D.L & Jones E. W. *Genetic analysis of Genes and Genomes* Jones and Bartlett Pub, Boston, 2000.
10. Klug .S.W. & Cummings, M.R. *Concepts of Genetics.* Pearson Education Pvt. Ltd.,

Singapore. Kreezer et al . 2001. *Recombinant DNA and Biotechnology*. American Society for Cell Biology, New York, 2003.
11. Lodish Harvey. *Molecular Cell Biology*. W.H. Freeman &Co. New York, 1999.
12. Russell, P.J. Genetics: *A Molecular Approach* (2nd edition). Pearson/Benjamin Cumming, San Francisco, 2005.
13. Snustad, D. P. & Simmons M.J. *Principles of Genetics*. John Hailey & Sons Inc. U.S.A., 2003

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2. http:// ash. gene. ncl. ac .nk.
3. http://tor. cshl. org. http:www. gdb. org.
4. http: //www. neg r. org.
5. http: // www. genetics. wustl. edu.
6. http: // genome. imb- jena. dc.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
SKILL ENHANCEMENT COURSE - IV: PROFESSIONAL COMPETENCY COURSE
NAAN MUDHALVAN SCHEME (23PBYS43)
(From 2023 - 2024 Batch onwards)

HOURS/WEEK : 4 (L-3, T-1) **INT. MARKS : 100**
CREDITS : 2
DURATION : 60 hrs

Course Objectives

- To learn about the basics and functions of computer.
- To facilitate students to learn about Microsoft Word and Excel.
- To find out more about Microsoft Access.
- To introduce AI and ML for Biology students
- To know about big data and data analytics.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: how to use computer Internet, e-mail, Web browser and Web server
CO2[K2]: generalize to create Documents, Tables and Spreadsheets
CO3[K3]: elucidate the creation and use of PowerPoint presentations and DBMS
CO4[K4]: compare and acquire knowledge about AI and ML
CO5[K5]: develop the knowledge in big data and data analytics.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	1	3	2	1	2
CO2[K2]	3	3	2	2	3	2	1
CO3[K3]	2	2	3	3	1	1	1
CO4[K4]	3	3	3	3	3	-	2
CO5[K5]	3	3	2	2	3	1	1
Weightage of the course	14	14	11	13	12	5	7
Weighted percentage of Course contribution to POs	**3.58**	**3.92**	**3.44**	**4.09**	**4.23**	**1.91**	**2.68**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(12 hrs)**

BASICS OF COMPUTER: Computer - Functions and Components of Computer – Operating System - Windows – Android – Intranet & Internet – www - Browser - Email - URL -Search engines - Websites & Web pages.

UNIT II **(12 hrs)**

MICROSOFT OFFICE – I: Microsoft word: Creation of document – Formatting of page - Formatting of paragraph -Formatting of text - Creation and formatting of table. Microsoft Power Point: Creation and Designing of slides – Animation options -Applications of MS Word and MS Power point.

UNIT III **(12 hrs)**

MICROSOFT OFFICE – II: Microsoft Excel: workbook – work sheet – Formatting of row, column and cell - Creation and formatting of table - Creation and formatting of charts Microsoft Access: Database Management System (DBMS) – Creation and designing of form – Management of data in table – Generation of report Applications of MS Excel and MS Access

UNIT IV **(12 hrs)**

ARTIFICIAL INTELLIGENCE: Artificial Intelligence: Artificial Intelligence (AI) - What and Why? - Foundation of AI - The AI environment - Social Influence of AI - Applications and Future.

UNIT V **(12 hrs)**

BIG DATA AND DATA ANALYTICS: Big Data: Evolution - Data evolution - Big Data Definitions - Merits and Advantages of Big Data - Big Data Characteristics - Big Data Applications - Introduction to Data Analytics - Data Analysis Vs. Data Analytics - Types of Data Analytics - Application of Data Analytics.

TEXTBOOKS

1. Rajaraman, V and N. Adabala, (6th Edition). *Fundamentals of Computers*, Prentice Hall of India Pvt. Ltd. New Delhi, 2015.
2. Anita Goel. *Computer Fundamentals*, Pearson Education, 2010.
3. Sinha, P.K. *Computer Fundamentals*, BPB Publications New Delhi 6th Edition, 2004.
4. Reema Thareja. *Fundamentals of Computers*, Oxford University Press, 2014.
5. Mooris mano. "*Digital Design*" Prentice Hall of India PVT Ltd., New Delhi, 1996.

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1. Forouzan, B. A. *Data Communication and Networking*, 5th Edition, TMH, 2013.

2. Balagurusamy, E. *Fundamentals of computers*, Tata Mc Grw-Hill, New Delhi, 2011.
3. Snustad, D. P. & Simmons M.J. *Principles of Genetics*. John Hailey & Sons Inc. U.S.A., 2003.
4. Harley Hahn. *The Internet-Complete Reference*, Tata Mc Grw-Hill, New Delhi
5. Kaliraj, P and Devi, T. H*igher Education for Industry 4.0 and Transformation of Education* 5.0, 2020.
6. Arthur Conklin W.M., and Greg White. *Principles of computer security*. TMH., McGraw-Hill Education; 4th edition, 2016.

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4. https://www.classcentral.com/institution/npte
5. https://swayam.gov.in

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
PG Programme - M.Sc. Botany
SEMESTER – IV
EXTENSION ACTIVITY
(From 2023 -2024 Batch Onwards)

HOURS/WEEK : - **INT. MARKS: 100**
CREDIT : 1
DURATION : -

Course Objectives

- To promote community involvement, encourage civic participation, and foster a sense of ownership and responsibility.
- To involve the learners in organizing campaigns, seminars, or public events to educate the public, promote understanding, and advocate for positive change.
- To create platforms for knowledge sharing, partnership development, and collective action.
- To encourage environmental conservation, promote responsible resource management, or foster sustainable livelihoods.
- To raise awareness about social issues, advocate for marginalized groups, or implement programs that promote inclusivity and equal opportunities.

Course Outcomes (CO)

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

CO1 [K1]: recognize the importance of community service through training and education

CO2 [K2]: interpret ecological concerns, consumer rights, gender issues & legal protection

CO3 [K3]: develop team spirit, verbal/nonverbal communication and organizational ethics by participating in community service

CO4 [K4]: examine the necessity of professional skills & community-oriented services for a holistic development

CO5 [K6]: create awareness on human rights, legal rights, First Aid, Physical fitness and wellbeing

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	-	-	2	2	1	1
CO2 [K2]	2	1	-	2	1	1	1
CO3 [K3]	2	-	-	1	2	2	1
CO4 [K4]	1	1	1	1	2	2	1
CO5 [K6]	1	-	-	1	2	2	1
Weightage of the course	8	2	1	7	9	8	5
Weighted percentage of Course contribution to POs	**2.01**	**0.56**	**0.31**	**2.15**	**3.07**	**2.96**	**1.88**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Details of the Courses

1 Physical Education
2 Red Ribbon Club (RRC)
3 Youth Red Cross (YRC)
4 Fine Arts Club
5 Library and Information Service Club
6 Yoga Club
7 ECO Club
8 Consumer Club
9 Human Rights Club
10 Women Empowerment Cell
11 Legal Awareness League