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 2021-2022 Batch onwards)

Department of Botany

PG Programme

Approved in the Academic Council-XIII held on 11/08/2021

Curriculum Design and Development Cell
Annexure O

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
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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. P. Gopal** Assistant Professor Department of Plant Biotechnology 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	**Mr. V. Sakkamuthu** Field Assistant, DST Project Kalasalingam School of Agriculture and Horticulture Kalasalingam Academy of Research and Education (Deemed to be University), Anand Nagar, Krishnankovil.
Members		
7.	Dr.R. Narayanaprakash	Guest Faculty in Botany
8.	Dr. G. Manikandan	Assistant Professor of Botany
9.	Dr.M. Murugan	Assistant Professor of Botany
10.	Dr.A. Sarvalingam	Assistant Professor of Botany
11.	Dr. S. Jeyakumar	Assistant Professor of Botany
12.	Dr.V. Muniappan	Assistant Professor of Botany
13.	Mr.G. Varatharaju	Assistant Professor of Botany
14.	Dr.C. Divya	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

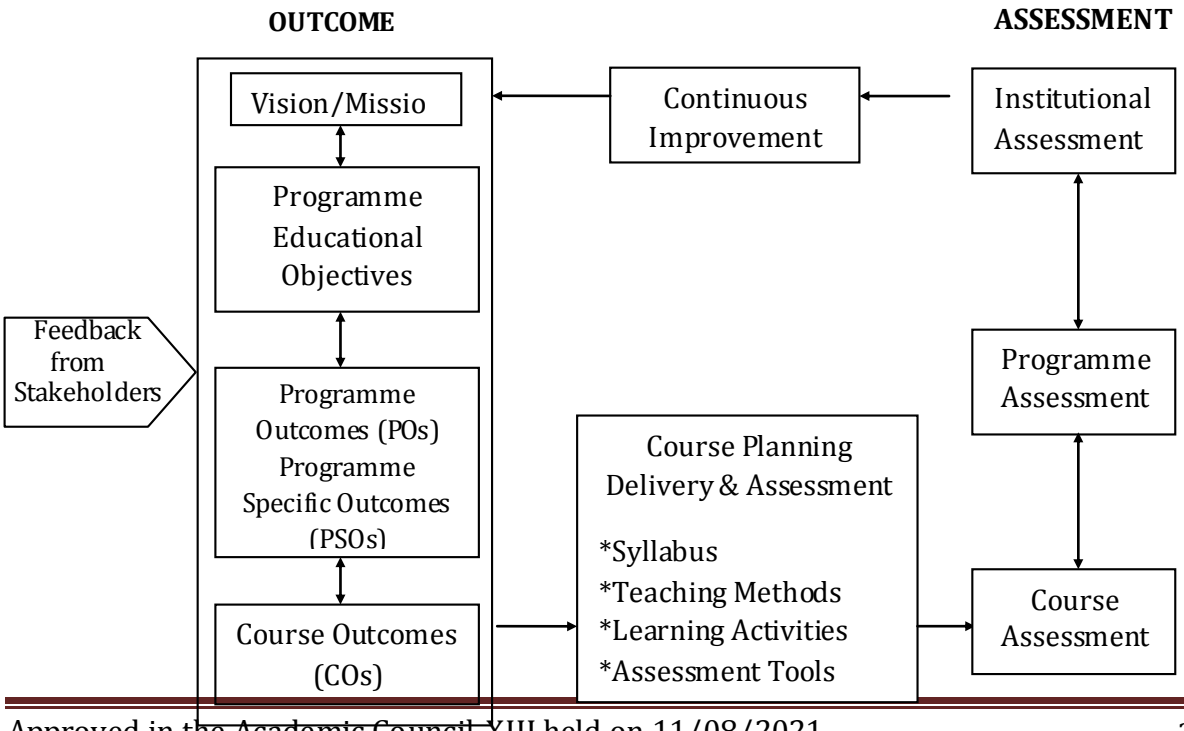
(From 2021-2022 Batch onwards)

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 with CGPA (3.11) 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 instill 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

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

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

PO \ PEO	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 2021 - 2023 may be permitted to write their examinations in this pattern up to April 2026.

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

For both UG and PG Programmes, the Internal and External marks are distributed as follows:

For all Theory Courses : Internal Marks: 40; External Marks: 60

For all Practical Courses and Project : Internal Marks: 50; External Marks: 50

Internal Mark Distribution for Theory Courses

Assessment Type	Marks	Scheme of Assessment
Internal Test	15 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 one of the Assignments will be given
Quiz	5 marks	One Quiz Test will be conducted
Viva/ Oral Exam/ Group discussion/ Role Play	10 marks	Test will be conducted in any one of the Oral Mode
Seminar	5 marks	One Seminar for each course

Internal Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work/Program Execution	40 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	40 marks	End result of the Practical
Viva –Voce	10 marks	Oral Mode Test

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG 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 – 4 questions Fill in the blanks – 4 questions	 04 04
2.	Short Answer –3 questions – either or type	3x4=12
3.	Long Answer–2 questions – either or type	2x10=20

Summative Examinations – 60 Marks -3 hrs Duration

S.No	Type of Questions	Marks
1.	Objective type Questions Multiple Choice – 5 questions Fill in the blanks – 5 questions	 05 05
2.	Short Answer 5 questions –either or type	5x4=20
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,

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

Percentage attainment of each Course outcome for Internal Assessment tools = 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 attain = 0.7 x Direct assessment of CO attainment + 0.3 x Indirect assessmer

Expected Level of Attainment for each of the Course Outcomes

CO	Level of Attainment
Above 70%	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.

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

Expected Level of Attainment for each of the Programme Outcomes

PO	Level of Attainment
Above 70%	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

PEO	Level of Attainment
Above 70%	Excellent
60 -70 %	Very good
50-60 %	Good
40 – 50 %	Satisfactory
Below 40%	Not Satisfactory

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi

DEPARTMENT OF BOTANY

PG Programme - M.Sc. Botany

CURRICULUM STRUCTURE

OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(From 2021-2022 Batch onwards)

S.No	Courses	Sem I	Sem II	Sem III	Sem IV	Credits
I	Core Courses	6 (5) 6 (5) 6 (5) 6P (4)	6 (5) 6 (5) 6 (5) 6P (4)	6 (5) 6 (5) 6 (5) 6P (4)	5 (5) 5 (5) 5P (4)	71
II	Elective Courses	6 (4)	-	6 (4)	--	8
III	Non -Major Elective Course	--	6 (4)	--	--	4
IV	Self-paced Learning (Swayam Course)	--	--	(3)	--	3
V	Project	--	--	--	15 (4)	4
	Total Hours(Per week)/ Credits	30(23)	30(23)	30(26)	30(18)	120 90

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
CURRICULUM PATTERN
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)
PROGRAMME CODE – PBY

Semester	Course Code	Course Name	Hours	Credits
I	21PBYC11	**Core Course - I:** Taxonomy of Angiosperms	6	5
	21PBYC12	**Core Course - II:** Developmental Botany	6	5
	21PBYC13	**Core Course - III:** Plant Diversity	6	5
	21PBYC1P	**Core Course - IV:** Practical: Taxonomy of Angiosperms Developmental Botany and Plant Diversity	6	4
	21PBYO11 21PBYO12 21PBYO13	**Elective Course – I:** 1. Herbal Technology 2. Biofertilizer Technology 3. Ethnobotany and Bio-resources	6	4
		Total	**30**	**23**
II	21PBYC21	**Core Course - V:** Instrumentation Techniques and Biostatistics and Research Methodology	6	5
	21PBYC22	**Core Course - VI:** Cell and Molecular Biology	6	5
	21PBYC23	**Core Course - VII:** Plant Biotechnology and Bioinformatics	6	5
	21PBYC2P	**Core Course - VIII:** Practical: Instrumentation Techniques, Biostatistics, Cell and Molecular Biology, Plant Biotechnology and Bioinformatics	6	4
	21PBYN21	**Non Major Elective Course :** Home Gardening	6	4
		Total	**30**	**23**
III	21PBYC31	**Core Course–IX:** Microbiology and Plant Pathology	6	5
	21PBYC32	**Core Course –X:** Genetics and Evolution	6	5
	21PBYC33	**Core Course–XI:** Biochemistry	6	5
	21PBYC3P	**Core Course –XII:** Practical: Microbiology, Plant Pathology, Genetics and Biochemistry	6	4
	21PBYO31 21PBYO32 21PBYO33	**Elective Course– II:** 1. Biodiversity and Conservation 2. Palynology and Pollination Biology 3. Recent Advances in Botany	6	4
	21PBYM31 21PBYM32	**Self-paced Learning – (Swayam Course)** 1. Forests and their Management 2. Applied Environmental Microbiology		3
		Total	**30**	**26**
IV	21PBYC41	**Core Course –XIII:** Plant Physiology	5	5

	21PBYC42	**Core Course –XIV:** Plant Ecology	5	5
	21PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant Ecology	5	4
	21PBYJ41	**Core Course –XVI:** Project	15	4
		Total	**30**	**18**

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Boany
(From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX (PAM)

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	21PBYC11	**Core Course - I:** Taxonomy of Angiosperms	12	13	12	8	4	2	4
	21PBYC12	**Core Course - II:** Developmental Botany	11	13	11	5	4	3	6
	21PBYC13	**Core Course - III:** Plant Diversity	15	11	10	5	3	3	4
	21PBYC1P	**Core Course - IV:** Practical: Taxonomy of Angiosperms Developmental Botany and Plant Diversity	15	12	10	10	2	3	3
	21PBYO11 21PBYO12 21PBYO13	**Elective Course – I:** 1. Herbal Technology 2. Biofertilizer Technology 3. Ethnobotany and Bio-resources	13	11	10	5	3	6	5
II	21PBYC21	**Core Course - V:** Instrumentation Techniques and Biostatistics and Research Methodology	15	11	8	6	6	5	4
	21PBYC22	**Core Course - VI:** Cell and Molecular Biology	15	11	12	6	4	3	3
	21PBYC23	**Core Course - VII:** Plant Biotechnology and Bioinformatics	12	10	10	8	7	6	4
	21PBYC2P	**Core Course - VIII:** Practical: Instrumentation Techniques, Biostatistics, Cell and Molecular Biology, Plant Biotechnology and Bioinformatics	13	10	8	8	9	6	6
	21PBYN21	**Non Major Elective Course :** Home Gardening	12	7	4	9	4	7	3
III	21PBYC31	**Core Course–IX:** Microbiology and Plant Pathology	10	10	10	7	3	2	8
	21PBYC32	**Core Course –X:** Genetics and Evolution	15	10	10	9	4	5	2
	21PBYC33	**Core Course–XI:** Biochemistry	12	10	9	10	8	3	6
	21PBYC3P	**Core Course –XII:** Practical:	14	10	7	8	7	4	6

		Microbiology, Plant Pathology, Genetics and Biochemistry							
	21PBYO31 21PBYO32 21PBYO33	**Elective Course– II:** 1. Biodiversity and Conservation 2. Palynology and Pollination Biology 3. Recent Advances in Botany	13	11	10	5	3	6	5
	21PBYM31 21PBYM32	**Self-paced Learning – (Swayam Course)** 1. Forests and their Management 2. Applied Environmental Microbiology	10	10	10	7	3	2	8
IV	21PBYC41	**Core Course –XIII:** Plant Physiology	13	12	12	7	4	3	4
	21PBYC42	**Core Course –XIV:** Plant Ecology	15	10	8	10	4	4	4
	21PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant Ecology	15	10	11	10	6	4	3
	21PBYJ41	**Core Course –XVI:** Project	14	13	12	4	5	5	5
Total Weightage of all Courses Contributing to PO			**264**	**215**	**194**	**147**	**93**	**82**	**97**

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DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX – WEIGHTED PERCENTAGE

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	21PBYC11	**Core Course - I:** Taxonomy of Angiosperms	4.55	6.05	6.19	5.44	4.3	2.44	4.3
	21PBYC12	**Core Course - II:** Developmental Botany	4.17	6.05	5.67	3.4	4.3	3.66	6.45
	21PBYC13	**Core Course - III:** Plant Diversity	5.68	5.12	5.15	3.4	3.23	3.66	4.3
	21PBYC1P	**Core Course - IV:** Practical: Taxonomy of Angiosperms Developmental Botany and Plant Diversity	5.68	5.58	5.15	6.8	2.15	3.66	3.23
	21PBYO11 21PBYO12 21PBYO13	**Elective Course – I:** 1. Herbal Technology 2. Biofertilizer Technology 3. Ethnobotany and Bio-resources	4.92	5.12	5.15	3.4	3.23	7.32	5.38
II	21PBYC21	**Core Course - V:** Instrumentation Techniques and Biostatistics and Research Methodology	5.68	5.12	4.12	4.08	6.45	6.1	4.3
	21PBYC22	**Core Course - VI:** Cell and Molecular Biology	5.68	5.12	6.19	4.08	4.3	3.66	3.23
	21PBYC23	**Core Course - VII:** Plant Biotechnology and Bioinformatics	4.55	4.65	5.15	5.44	7.53	7.32	4.3
	21PBYC2P	**Core Course - VIII:** Practical: Instrumentation Techniques, Biostatistics, Cell and Molecular Biology, Plant Biotechnology and Bioinformatics	4.92	4.65	4.12	5.44	9.68	7.32	6.45
	21PBYN21	**Non Major Elective Course :**	4.55	3.26	2.06	6.12	4.3	8.54	3.23

		Home Gardening							
III	21PBYC31	**Core Course–IX:** Microbiology and Plant Pathology	3.79	4.65	5.15	4.76	3.23	2.44	8.6
	21PBYC32	**Core Course –X:** Genetics and Evolution	5.68	4.65	5.15	6.12	4.3	6.1	2.15
	21PBYC33	**Core Course – XI:** Biochemistry	4.55	4.65	4.64	6.8	8.6	3.66	6.45
	21PBYC3P	**Core Course –XII:** Practical: Microbiology, Plant Pathology, Genetics and Biochemistry	5.3	4.65	3.61	5.44	7.53	4.88	6.45
	21PBYO31 21PBYO32 21PBYO33	**Elective Course– II:** 1. Biodiversity and Conservation 2. Palynology and Pollination Biology 3. Recent Advances in Botany	4.92	5.12	5.15	3.4	3.23	7.32	5.38
	21PBYM31 21PBYM32	**Self-paced Learning – (Swayam Course)** 1. Forests and their Management 2. Applied Environmental Microbiology	3.79	4.65	5.15	4.76	3.23	2.44	8.25
IV	21PBYC41	**Core Course –XIII:** Plant Physiology	4.92	5.58	6.19	4.76	4.3	3.66	4.3
	21PBYC42	**Core Course –XIV:** Plant Ecology	5.68	4.65	4.12	6.8	4.3	4.88	4.3
	21PBYC4P	**Core Course –XV:** Practical: Plant Physiology and Plant Ecology	5.68	4.65	5.67	6.8	6.45	4.88	3.23
	21PBYJ41	**Core Course –XVI:** Project	5.3	6.05	6.19	2.72	5.38	6.1	5.38
Total Weighted Percentage of Course Contribution 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: TAXONOMY OF ANGIOSPERMS (21PBYC11)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the students to gain knowledge on Morphological characters of Angiosperms and Herbarium preparation.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: illustrate the morphological key characters of Angiosperms
CO2[K3]: explain the economic importance of angiosperm families
CO3[K4]: classify the taxonomy of angiosperms
CO4[K5]: justify the new plant species
CO5[K6]: prepare the herbarium and key for angiosperm families

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	-	-	-	-
CO2[K3]	3	3	2	2	2	-	-
CO3[K4]	2	2	2	2	-	-	2
CO4[K5]	2	3	3	2	1	1	-
CO5[K6]	2	2	2	2	1	1	2
Weightage of the course	12	13	12	8	4	2	4
Weighted percentage of Course contribution to POs	**4.55**	**6.05**	**6.19**	**5.44**	**4.3**	**2.44**	**4.3**

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

UNIT I **(18 hrs)**

Characteristic of Angiosperms: Scope and Importance of Plant Taxonomy, Botanical Nomenclature: Binomial Systems, ICBN and ICN: Principles; Retention and Rejection of Names; Typifications; Effective and Valid Publication; Author Citation, Botanical nyms.

UNIT II **(18 hrs)**

System of Classification: Natural (Bentham and Hooker), Artificial (Linnaeus), Phylogenetic (Engler and Prantl and Hutchinson) and APG (I-IV) system of Classification.

UNIT III **(18 hrs)**

Types of Taxonomy and Herbarium Techniques: Numerical Taxonomy, Molecular Taxonomy and Chemo taxonomy. Herbarium Techniques, Virtual Herbarium, E-Flora and Importance. Centers of National and International Herbarium; Dichotomous Key preparation – types and techniques.

UNIT IV **(18 hrs)**

Vegetative and Floral Features and Economic Importance: Dicotyledons: Annonaceae, Ranunculiaceae, Magnoliaceae, Brassicaceae (Cruciferae), Rutaceae, Cucurbitaceae, Apiaceae, Balsaminaceae, Nymphaeaceae, Rubiaceae, Asteraceae, Leguminosae, Apocynaceae, Solanaceae, Acanthaceae, Oleaceae, Lamiaceae and Rosaceae.

UNIT V **(18 hrs)**

Vegetative and Floral Features and Economic Importance: Monochlamydae: Amaranthaceae, Loranthaceae, Dioscoriaceae, Moraceae and Phyllanthaceae. Monocotyledons: Colchicaceae, Orchidaceae, Zingiberaceae Arecaceae, Commelinaceae, Cyperaceae and Poaceae. Differentiation in Dicot & Monocot; Polypetalae, Gamopetalae and Monochlamydae.

TEXTBOOKS

1. Sharma, O.P. *Plant Taxonomy.* 2nd Edition. Mc Graw-Hill Publications Pvt. Ltd. 2017
2. Sharma, O.P. *Plant Taxonomy.* Tata Mc Graw-Hill Publications Pvt. Ltd. 2006.
3. Panday, B.P. *Text Book of Botany Angiosperms.* S.Chand Pvt. Ltd,. 2015.

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Books

1. Naik N. *Taxonomy of Angiosperms.* Tata McGraw Hill, New Delhi, 1984.
2. Pullaiah T.*Taxonomy of Angiosperms.* Regency Publications, New Delhi, 1998.
3. Sivaranjan V V. *Introduction to Principles of Plant Taxonomy.* Kalyani Publishers, New Delhi, 1984.
4. Sambamurthy. *Taxonomy of Angiosperms.* I K International Pvt. Ltd., 2005.
5. Cronquist A. *The Evolution and classification of flowering plants.* Thomas Nelson and Sons Ltd., London, 1968.
6. Jeffrey C., *An Introduction to Plant Taxonomy*, Cambridge Uni. Press. 2nd edn.1982.
7. Jhori B M., and Bhatacharjee S P. *Taxonomy of Angiosperms*. Narosa Publishers, New Delhi, 1994.
8. Lawrence GHM. *Taxonomy of Vascular Plants.* MacMillan, London, 1951.

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1. https://www.brainkart.com/article/Bentham-and-Hooker-s-classification-of-plants---Dicotyledonae,-Gymnospermae-and-Monocotyledonae_1000/
2. https://www.yourarticlelibrary.com/pharmacognosy/plant-taxonomy/rutaceae-position-vegetative-and-floral-characters/49514#:~:text=Corolla%3A-,ADVERTISEMENTS%3A,anthers%20dorsifixed%2C%20introse%2C%20inferior
3. https://www.slideshare.net/BijuCherupuzha/herbarium-10212042#:~:text=HERBARIUM%20TECHNIQUES%20It%20involves%20a,%2C%20labelling%2C%20filling%20and%20deposition.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG PROGRAMME - M.Sc. BOTANY
SEMESTER - I
CORE COURSE - II: DEVELOPMENTAL BOTANY (21PBYC12)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course intends to provide an insight to understand the Origin, Structure, Growth, Development and reproduction in angiosperm plants.

Course Outcomes (CO)

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

CO1[K2]: demonstrate the meristematic theory and their classification. Anomalous secondary growth in Dicot and Monocot

CO2[K3]: articulate on leaf origin, Floral anatomy and types of plant galls

CO3[K4]: compare the development of microsprogenesis and megasporogenesis

CO4[K4]: analyze the embryo culture and crop improvement in hybridization

CO5[K5]: assess the pollen and embryo development

CO-PO Mapping Table (Course Articulation Matrix)

Po / Co	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	2	1	-	1	2
CO2[K3]	3	2	2	-	-	-	-
CO3[K4]	1	3	2	1	-	1	2
CO4[K4]	1	2	3	1	2	1	-
CO5[K5]	3	3	2	2	2	-	2
Weight age of the course	11	13	11	5	4	3	6
Weighted percentage of Course contribution to Pos	**4.17**	**6.05**	**5.67**	**3.4**	**4.3**	**3.66**	**6.45**

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

UNIT I **(18 hrs)**

Meristems: Structure and Types, General account on theories of Meristems – Apical cell theory, Tunica - Corpus theory and Korper - Kappe concept. Vascular cambium - Types, divisions, arrangement and seasonal activity. Origin, Development, function and Structure of phylogenetic trends of xylem and phloem. Primary and Anomalous secondary growth in Dicot and Monocot.

UNIT II **(18 hrs)**

Nodal Anatomy – Uni, Bi, Tri and Multi nodal Leaf trace and gap Transfer Cells – Structure, Development and Functions. Flower - Floral Anatomy and its Role. Structure and types of Plant Gall (or) Cecidia and their importance in morphogenesis. Root - Stem transition. Role of Polarity in Cell Differentiation, Symmetry. Role of Vascularization in flower and seedling.

UNIT III **(18 hrs)**

Microsporogenesis: male gametophyte Structure and Development; Physiological Relationship of Tapetum and Sporogenous Tissues, Pollen Fertility, Sterility, Pollen Storage and Pollen Germination; Megasporogenesis; Female Gametophyte, Structure and Development Pistil. Types of Stigma and Style. Types of ovule.

UNIT IV **(18 hrs)**

Pollen – Pistil Interaction. Events on Stigmatic Surface, Pollen Tube Growth, Guidance and Entry into Ovule and Embryo sac, Double Fertilization and triple fusion – Significance; Incompatibility – Interspecific – Homomorphic and Heteromorphic Causes. Methods to Overcome Incompatibility. Development of Dicot and Monocot Embryo.

UNIT V **(18 hrs)**

Structure, types and development of Endosperm. Storage proteins of endosperm and embryo, polyembryony, Parthenocarpy and apomixes. Development of fruits.

TEXTBOOKS

1. Bhojwani, S.S. and Bhatnagar,S.P. *Embryology of Angiosperms.* S.Chand and Co., NewDelhi, 2016.
2. Tayal, M.S. *Plant Anatomy.* Rastogi publications, Meerut, 2017.
3. Pandey, B.P. *Plant Anatomy.* S. Chand Company Ltd., New Delhi, 2001.

REFERENCES

Books

1. Pandey, S.N. and Chadha, A. *Embryology*. Vikas Publishing House Pvt. Ltd., New Delhi, 2000.
2. Pandey, A.K. *Introduction to Embryology of Angiosperms.* CBS Publishers and
3. Distributors, New Delhi, 1997.
4. Johri, B.M. *Embryology of Angiosperms.* Springer Verlag, Berlin, 1984.

Web Sources

1. https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/08%3A_Shoot_Anatomy_and_Morphology/8.3%3A_Shoot_Development.
2. https://onlinecourses.nptel.ac.in/noc19_bt17/preview.
3. https://www.mgu.ac.in/uploads/2017/09/Botany-MODEL-I-model-IImodel-III-2017.pdf?x82015.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
CORE COURSE - III: PLANT DIVERSITY (21PBYC13)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the systematic position, Morphology and structure of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms and their economic importance.

Course Outcomes (CO)

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

CO1[K1]: identify the core concepts the structure, reproduction and life-cycle of higher and lower plants

CO2[K2]: classify diversity of plant kingdom and their salient features.

CO3[K3]: build the knowledge about structure and life cycle pattern of algae, fungi, lichens, bryophytes, Pteridophytes and Gymnosperms.

CO4[K5]: justify the evolutionary trends the salient features of pherograme and cryptogram plants.

CO5[K6]: evaluate the acquired plant based medicine, ornamental and spiritual well being, fodder and fuel wood

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	-	-	-
CO2[K2]	3	2	2	1	-	-	1
CO3[K3]	3	3	2	1	-	-	1
CO4[K5]	3	2	2	1	1	1	1
CO5[K6]	3	2	2	1	2	2	1
Weightage of the course	15	11	10	5	3	3	4
Weighted percentage of Course contribution to Pos	**5.68**	**5.12**	**5.15**	**3.4**	**3.23**	**3.66**	**4.3**

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

UNIT I **(18 hrs)**

Algae: General Characteristics features and Classification of Algae by Fritsch (1935). Structure, Reproduction and life cycles of Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta, Rhodophyta. Ultrastructure of Prokaryotic and Eukaryotic algal cells and their components - cell wall, protoplasm, flagella, eye spots, chloroplast, pyrenoid, nucleus, pigments and reserve foods. Economic importance of algae.

UNIT II **(18 hrs)**

Fungi and Lichens: General characteristics and Classification of fungi based on C.J Alexopoulos (1962). Study of somatic and reproductive structures of the following classes: Zygomycetes, Ascomycetes, Basidiomycetes & Deuteromycetes. Economic importance of Fungi. Introduction to Lichens, Classification, Distribution, Types, Nature of Mycobionst and Phycobionts, Thallus organization, Reproduction and Economic importance of Lichens. Identification of lichens using ICT tools: Artificial intelligence, MATLAB software, Image processing tools.

UNIT III **(18 hrs)**

Bryophytes: General Characteristics features - occurrence and distribution - classification, basis and criteria of classification based on Rothmaler (1951), structural variation in the gametophytes and sporophytes; evolution of sporophyte and gametophytes; Reproduction, life histories of *Marchantia, Porella, Fossombronia, Anthoceros and Polytrichum.* Economic importance of Bryophytes. An account of fossil bryophytes and their significance.

UNIT IV **(18 hrs)**

Pteridophytes: General characteristics and Classification based on Sporne (1975). Comparative morphology and structure – *Psilotum*, *Lycopodium*, *Equisetum* and *Pteris*. Structure and evolutionary trends with reference to stele and spore. Telome concept in Pteridophytes; the phenomemon of apospory, apogamy and parthenogenesis. An account of fossil Pteridophytes and their significance. Economic importance Pteridophytes**.**

UNIT V **(18 hrs)**

Gymnosperms: General characteristics and Classification of Gymnosperm based on Chamberlain (1934). Study on structure and life cycle of *Cycas, Araucaria* and *Gnetum*. Structure, life histories and Phylogenetic considerations of *Ephedra* and *Welwitschia*. Economic importance of gymnosperms; outline of fossil plants.

TEXTBOOKS

1. Pandey, P.B. *College Botany - 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta*. Chand Publishing, New Delhi. 2014.
2. Parihar, N.S. *An Introduction to Embryophyta Pteridophytes*. 5th Edition, Surjeet Publication, Delhi, 2019.
3. Johri, R.M., Lata, S. and Sharma, S. *A Text Book of Bryophyta.* Dominant Publishers and Distributors, New Delhi, 2004.
4. Vashishta, P.C., Sinha,A.K., and Kumar, A. *Pteridophyta.* S.Chand and Co.,Ltd. New Delhi, Ninth Edition, 2006.

REFERENCES

Books

1. Sharma, O.P. *Pteridophyta.* Tata McGraw-Hill Education, Delhi. 2012.
2. Vashishta, B.R., Sinha,A.K. and Singh,V.P. *Algae.* Nineth Edition S.Chand and Co., New Delhi, 2010.
3. Vashishta, B.R. *Fungi.* S.Chand and Co., New Delhi, Sixth Edition. 2008.
4. Sharma, P.D. *Fungi and Allied Organisms*. Narosa Publishing House, New Delhi, 2005.

Web Sources

1. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(OpenStax)/05%3A_The_Eukaryotes_of_Microbiology/5.04%3A_Algae.
2. https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/24%3A_Fungi/24.1%3A_Characteristics_of_Fungi/24.1A%3A_Characteristics_of_Fungi.
3. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(OpenStax)/05%3A_The_Eukaryotes_of_Microbiology/5.05%3A_Lichens.
4. https://es.wikipedia.org/wiki/Archivo:Album_g%C3%A9n%C3%A9ral_des_Cryptogames,_Pl._198.jpg.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. BOTANY
SEMESTER - I
CORE COURSE - IV: PRACTICAL: TAXONOMY OF ANGIOSPERMS, DEVELOPMENTAL BOTANY AND PLANT DIVERSITY (21PBYC1P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course facilitates the students to understand the morphological, anatomical, taxonomical and developmental aspect of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm.

Course Outcomes (CO)

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

CO1[K2]: demonstrate the preparation of temporary and permanent mount slides and sectioning of plant materials.

CO2[K3]: determine various groups of plants based on structural and anatomical variations

CO3[K4]: examine the internal anatomical features of Plant systems.

CO4[K5]: evaluate the anatomical variation among the plant species.

CO5[K6]: develop the suitable technique for the study of internal structure of Pteridophytes, Gymnosperms and Angiosperms.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	2	-	1	-
CO2[K3]	3	3	3	2	-	-	-
CO3[K4]	3	3	2	2	1	-	1
CO4[K5]	3	2	2	2	1	1	1
CO5[K6]	3	2	2	2	-	1	1
Weightage of the course	15	12	10	10	2	3	3
Weighted percentage of Course contribution to Pos	5.68	5.58	5.15	6.8	2.15	3.66	3.23

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

Examination & Micro Preparations of the Vegetative part of the Following Lower Plant groups:

Algae : *Nostoc, Spirulina, Oedogonium,* Diatoms, *Sargassum* and *Gracillaria. Caulerpa*

Fungi : *Mucor, Rhizopus* , *Penicillium*, *Alterneria, Puccinia* and *Cercospora*

Bryophytes : *Marchantia, Anthoceros* and *Polytrichum*

Lichens : *Usnea* & Apothecium of Foliose type

Permanent mount slide preparation of Internal Structure of the following Higher Plant groups:

Pteridophytes: *Isoetes, Psilotum, Selaginella, Equisetum* and *Marsilea*

Gymnosperms: *Cycas, Pinus*, *Araucaria* and *Gnetum*

Taxonomy of Angiosperms:

1. Preparation of dichotomous keys
2. Identification of families mentioned in the syllabus with the help of floral characters.
3. Submission of minimum 25 herbarium sheets representing different locations
4. Students must be taken minimum 3 days field trip for herbarium collection.

Developmental Botany:

1. Observation of types of ovule & Placentation
2. Dissection of Anther and Observation of pollen types and germination studies
3. Endosperm haustoria
4. Study of wood anatomy (*Mangifera* and *Dalbergia*)
5. Structural anomalies in stems of *Achyranthus*, *Boerhaavia* and *Bougainvillea*
6. Preparation of 5 permanent slides using microtome and double staining

REFERENCES

Books

1. Bendre, A., Kumar. *Text Book of Practical Botany 1 &2.* Rastogi publication 2015
2. Sharma, OP. *Taxonomy of Angiosperm.* Tata McGraw-Hill, New Delhi. 2012
3. Pandey B.P. *Modern Practical Botany - Vol. 1-3.* S. Chand Publication. 2010
4. Santra. *The Practical Botany: Vol. 1-3.* NCBA Publication. 2015

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSE - I: HERBAL TECHNOLOGY (21PBY011)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the students to gain knowledge on biochemical mechanisms of action of drugs, drug uses and therapeutic roles, side effects, potential interactions, research and development of new drugs, their approvals and regulations.

Course Outcomes (CO)

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

CO1[K1]: define the importance of medicinal plants

CO2[K2]: explain the phytochemistry and pharmacological aspects of medicinal plants

CO3[K3]: utilize the medicinal plants for biological activity

CO4[K3]: separate the biological active compounds from plants through chromatographic techniques

CO5[K4]: analyze the various collection methods for ethnobotanical knowledge from tribals.

CO-PO Mapping table (Course Articulation Matrix)

Po / Co	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	-	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	2	3	2	1	-	2	2
CO4[K3]	2	2	2	1	1	-	1
CO5[K4]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to Pos	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Commercial cultivation, harvest technology, importance and utilization of following medicinal plants - Aswagantha (*Withania somnifera*), Opium (*Papaver somniferum*), Senna (*Senna alexandrina*), Lemongrass (*Cymbopogon citratus*), Toothache plant (*Acmella oleracea*), Turmeric (*Curcuma longa*), Zinger (*Zingiber officinale*).

UNIT II **(18 hrs)**

Phytochemical and pharmacological aspects of *Ocimum tenuiflorum, Gymnema sylvestre* and *Stevia rebaudiana*. Isolation and purification techniques of Piperine from *Piper nigrum*, Caffeine from *Coffea arabica*, Quinine from *Cinchona officinalis*, Strychnine and Brucine from *Strychnos nux-vomica*, Eugenol from *Syzygium aromaticum*.

UNIT III **(18 hrs)**

Natural Plant products derived from marine source with special reference to cardiovascular, anti-cancer, antiviral, anti-microbial, anti-parasitic, anticoagulant and anti-inflammatory agent.

UNIT IV **(18 hrs)**

Preliminary phytochemical analysis – Different solvent extraction, Quality analysis (Alkaloids, Flavanoids, Phenols, Steroids, saponins. Steroids, Tannins Terpenoids); Sample preparation and procedure of TLC, HPTLC, GLC, Paper chromatography, Super critical chromatography, chiral separation, Circular counter current chromatography and Iron exchange chromatography.

UNIT V **(18 hrs)**

Methods of Isolation of Volatile oil; Structure elucidation of chemical components by UV, FTIR, GC, GC-MS and NMR (Principles and Applications)

TEXTBOOKS

1. Arnason, Jone, T. Mata, Rachel, Romeo, John, T. Phytochemistry of medicinal plants. 2000.
2. James, A and Duke. *Handbook of phytochemical constituents of GRAS herbs and other economic plants*. 2001
3. Duddeck, Detrich, and Toth. *Structure elucidation by modern NMR, a workbook*. 1998.
4. Atta-Ur- Rahman and Muhammad Iqbal Choudhary. *Solving problems with NMR spectroscopy*. 1996.
5. Chukwuebuke, E., Jonathan, C. I., Stanley, C. U. and Shashank, S. *Phytochemistry*. Volume 1: Fundamentals, Modern techniques and application. 2019.

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1. Sethi, P D. *Quantitative Analysis of Drugs in Pharmaceutical formulation* -,3rd Edition, CBS Publishers, New Delhi, 1997.
2. Doglas A Skoog, F. James Holler,Timothy A. Nieman. *Principles of Instrumental Analysis.* 5th edition, Eastern press, Bangalore. 1998.
3. Farooqui, A.A . and Sreeramu, B.S. *Cultivation of medicinal and aromatic crops*. University Press. 2001.
4. Choudhary, R.D. *Herbal Drug Industry*. Eastern Publisher, New Delhi,1996.
5. Paul J. Schewer. *Chemistry of Marine Natural Products*. 1973.
6. Paul M. Dewick. *Medicinal natural products (a biosynthetic approach)*. John Wiley & Sons Ltd., England, 1998.
7. Kokate, C.K. Purohit, Ghokhale, Nirali Prakasshan. *Text book of Pharmacognosy*. 1996.
8. Thomson, R.H. *The Chemistry of Natural Products*. Edited by, SpringerInternationalEdn. 1994.
9. Bruneton, J. *Pharmacognosy & Phytochemistry of Medicinal Plants*. 2nd edition, Interceptt Ltd., New York, 1999.

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2. https://www.intechopen.com/books/oxidative-stress-and-chronic-degenerative-diseases-a-role-for-antioxidants/food-phenolic-compounds-main-classes-sources-and-their-antioxidant-power
3. https://www.frontiersin.org/articles/10.3389/fmars.2017.00384/full
4. https://agritech.tnau.ac.in/horticulture/extraction_methods_natural_essential_oil.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSE - I: BIOFERTILIZER TECHNOLOGY (21PBYO12)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

The course facilitates to aware the importance of biofertilizers in agriculture and organic farming.

Course Outcomes (CO)

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

CO1[K1]: identify the potential organisms to be used as Bacterial and fungal biofertilizers

CO2[K2]: illustrate the knowledge on organic farming

CO3[K3]: develop the knowledge about Biofertilizer production and application

CO4[K3]: examine the compost preparation and uses

CO5[K4]: conclude the comparative study of Vermicomposting and Vermiwash

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	-	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	2	3	2	1	-	2	2
CO4[K3]	2	2	2	1	1	-	1
CO5[K4]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to Pos	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Introduction and Types: Concept of fertilizers, chemical fertilizers and biofertilizer – impact on environment. Bacterial, Algal and Fungal Biofertilizers. Bacterial Biofertilizers- *Pseudomonas*, *Bacillus*, *Rhizobium* and Phosphobacteria: mass cultivation and field application of Rhizobia and *Pseudomonas*. Plant growth promotion and biocontrol mechanism of plant diseases.

UNIT II **(18 hrs)**

Nitrogen Fixation – Symbiotic and non-symbiotic, Isolation and Identification of Nitrogen fixing bacteria: Rhizobia and *Azotobacter*. Mechanism of N_2 Fixation with reference to Rhizobia and *Azotobacter*, Nif genes, Nodulation by *Rhizobium*.

UNIT III **(18 hrs)**

Algal Biofertilizer – Mass Cultivation of Blue green Algae – Nostoc and Anabena. Fungi: Mass Cultivation and application of VAM. Mass Cultivation of *Azolla*- cultivation and application. *Azospirillum* and its uses.

UNIT IV **(18 hrs)**

Organic Farming – Introduction, Advantages and Sources of Organic Farming. Recycling of wastes through Vermicompost. Methods of Vermicomposting – Pit Method, Heap Method, Windrow Method and Bin or Tray Method. Integrated farming - FYM and Cattle farm waste

UNIT V **(18 hrs)**

Vermiwash preparation and its Applications. Pancha Kavya – Production and Uses. Biofertilizer storage, Shelf life, Quality Control and Marketing. Bioenzyme Humic acid, Agniashthiram, Fish Aminoacid, Egg shell powder and Onion peel liquid.

TEXTBOOKS

1. Subbarao, N.S. *Biofertilizers in Agriculture and Forestry.* Oxford and IBH, 2009.
2. Subbarao, N.S. *Recent Advances in Biological Nitrogen Fixation.* Oxford and IBH, New Delhi, 2001.
3. Mary Violet Christy A. *Vermitechnology.* MJP Publishers, Chennai. 2008.
4. Arumugam N., Murugan T., Johnson Rajeswar J., and Ram Prabu R. *Applied Zoology.* 5th Edition, Saras Publication, Nagercoil. 2015.

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1. Tilak, K.V.B.R. *Algal and Bacterial Biofertilizers.* Indian Council for Agricultural Research, New Delhi, 2007.
2. Gillings, M. and Holms, A. *Microbiology and Plant Pathology.* Bios Scientific Publishers, NewYork, 2010.
3. Subbarao, N.S. *Soil Microorganism and Plant Growth.* 4th Edition, Oxford and IBH, New Delhi, 1995.
4. Rangaswami, G. and Bagyaraj, D.J. *Agricultural Microbiology.* Second Edition, Prentice-Hall Pvt. Ltd. New Delhi, 2001.

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1. https://www.youtube.com/watch?v=DyQUMOGUluM
2. https://www.youtube.com/watch?v=QV-kIt6wHok
3. https://www.youtube.com/watch?v=2l2MqBnIscU

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - I
ELECTIVE COURSE - I: ETHNOBOTANY AND BIO-RESOURCES (21PBYO13)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

The course facilitates to conduct field investigations on the relationship between the human beings and plants and also focuses on interviewing Elders about native plant uses and methods for conducting structured and non-structured interviews, plant collection, participant observation and data analysis.

Course Outcomes (CO)

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

CO1[K1]: explain the life style and traditional practices of plants by Indian Tribals.

CO2[K2]: perform the conservation practices for floristic and cultural diversity of the region.

CO3[K3]: analyze the various collection methods for ethnobotanical knowledge from tribals.

CO4[K3]: assess the methods to transform ethnobotanical knowledge into value added products.

CO5[K4]: design the protocol for digitization of ethnobotanical knowledge

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	-	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	2	3	2	1	-	2	2
CO4[K3]	2	2	2	1	1	-	1
CO5[K4]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to Pos	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Concept of Ethnobotany: Introduction Concept, scope, sub-disciplines, Role of ethnomedicine and its scope in modern times. Role of Ethnobotany in conservation and sustainable development. Centres of Ethno botanical studies in India, AICRPE-All India Coordinated Research Project on Ethno biology, FRLHT- Foundation for the Revitalisation of Local Health Traditions. Contributions of AICRPE and FRLHT to ethno biology of India.

UNIT II **(18 hrs)**

Ethnobotany Techniques: Methods and techniques used in Ethnobotany-Field level activities for data collection- Approach, Documentation, Forest productivity check by analysing the log books of Forest, EDC, VSS etc), Impact of Ethnobotany in herbal-medicine industry, land-use development, agriculture, forestry, betterment of rural livelihoods and education. Biodiversity and conservation of some useful medicinal 10 plants. Sharing of wealth concept with few examples from India.

UNIT III **(18 hrs)**

Indigenous/Traditional Knowledge: Plant used in ethno medicine preparation and their uses of following plants: *Justicia adhatoda, Ocimum tenuiflorum, Aegle marmelos, Phyllanthus amarus, Andrographis paniculata*. Non-timber forest products (NTFPs) as a source of livelihood option for tribals: Economic potential of NTFPs, Gender role in harvesting NTFPs, Good sustainable harvesting practice of some selected NTFPs, Role of society, herbal industries and government agencies for sustainable harvest and value addition. Types of Tamil Nadu Tribes

UNIT IV **(18 hrs)**

Bioprospecting: Introduction, scope and relevance. Brief account of Phytochemistry, pharmacodynamics and pharmacokinetics. Difference between herbal/botanicals and pharmaceutical medicine. Classification and sources of crude drugs. Quality, safety and efficacy of herbal medicines/ neutraceuticals. Role of ethnopharmacology in drug development. Biopiracy, Intellectual Property Rights(IPR). Ethnopharmacology and IPR issue.

UNIT V **(18 hrs)**

Value Addition: Bioprospecting of drug molecules derived from Indian traditional plants; Methods for bio prospecting of natural resources; From folk Taxonomy to species confirmation - evidences based on phylogenetic and metabolomic analyses; Ethnobotanical databases and Traditional knowledge Digital Library (TKDL). Biological screening of herbal drugs-introduction and need for phytopharmacological screening. In vitro and in vivo Screening methods used for herbal drugs.

TEXTBOOKS

1. Gokhale, S.B., Kokate, C.K. and Gokhale, A. *Pharmacognosy of Traditional Drugs*. 1st ed. Nirali Prakashan, Pune. 2016.
2. Joshi, S.G. *Medicinal Plants*. Oxford & IBH Publishing C., Pvt., Ltd., New Delhi. 2018.
3. Kumar, N. *A Textbook of Pharmacognosy*. Aitbs Publishers, India. 2018.
4. Premendra Singh. *Medicinal Plants: Conservation, Cultivation and Utilization*. Daya Publishing House, New Delhi. 2013.

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1. Albuquerque, U. P., Ramos, M. A., Júnior, W. S. F., and De Medeiros, P. M. *Ethnobotany for beginners*. Springer International Publishing, US. 2017.
2. Qadry, J.S. *A textbook of Pharmacognosy Theory and Practicals*. 17th ed. CBS Publishers & Distributors, New Delhi. 2014.
3. Balick, M. J., and Cox, P. A. *Plants, people, and culture: the science of ethnobotany*. Scientific American Library, US. 1996.
4. Singh, V. *Ethnobotany and Medicinal Plants of India and Nepal* (Vol. 3). Scientific Publishers. New Delhi. 2009.

Web Sources

1. https://shodhganga.inflibnet.ac.in/bitstream/10603/116454/7/07_chapter%201.pdf.
2. https://libstore.ugent.be/fulltxt/RUG01/002/217/123/RUG01-002217123_2015_0001_AC.pdf.
3. https://www.researchgate.net/publication/237405658_Ethnobotany_and_phytomedicine_of_the_upper_Nyong_valley_forest_in_Cameroon

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - V: INSTRUMENTATION TECHNIQUES AND BIOSTATISTICS AND RESEARCH METHODOLOGY (21PBYC21)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the working principles, construction and applications of the instruments used in biological sciences and the art of thesis and paper writing and publication.

Course Outcomes (CO)

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

CO1[K2]: demonstrate general laboratory procedures and maintenance of research equipments, microscopy, pH meter and preparation of different buffers

CO2[K3]: determine the methods of writing scientific paper and methods of statistical tool to solve the problems and know the importance of impact factor & citation index

CO3[K4]: analyze scientific data, research proposals & identification of funding agencies

CO4[K5]: resolve the research problems quantitatively using appropriate statistical methods and publish the data

CO5[K5]: evaluate and interpret visual representations of quantitative research data from experiment, such as graphs or charts by using statistical tool

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	1	2	-	1	-
CO2[K3]	3	2	2	-	-	-	-
CO3[K4]	3	2	1	1	1	2	1
CO4[K5]	3	2	2	1	3	2	2
CO5[K5]	3	2	2	2	2	-	1
Weightage of the course	15	11	8	6	6	5	4
Weighted percentage of Course contribution to POs	**5.68**	**5.12**	**4.12**	**4.08**	**6.45**	**6.1**	**4.3**

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

UNIT I **(18 hrs)**

General Laboratory procedures and maintenance of research equipments. Microscopy: Principles of Light, Phase contrast, Fluorescent, Electron microscopy – SEM and TEM. pH basic principles and application of pH meter- Principles and application of buffers. Microtome - types and functions, Fixatives and Fixation for Histo-chemical study, Principles and practice of staining (single and double).

UNIT II **(18 hrs)**

Chromatography-principle, types- Paper, TLC, Column, Adsorption & Affinity, HPLC, GC-MS. Electrophoresis- Principle, type- polyacrylamide & agarose. Centrifugation. Spectroscopic techniques- UV-Visible and FT-IR - Flame photometer, Principle and applications ELISA.

UNIT III **(18 hrs)**

Statistical Methods: Data analysis, Central measures (mean, medium, mode); Dispersion measures (range, standard deviation), Standard deviation, Standard error, Co-efficient of variation, Null Hypothesis, level of significance, probability, correlation and regression, and normal distribution, parametric and non parametric tests, t-test, f-test, chi-square test, ANOVA.

UNIT IV **(18 hrs)**

Research: Definition, objectives, types- pure research, applied research, descriptive, experimental, historical, and importance. Research process, Identification and criteria of selecting a Research Problem (Hypothesis), literature collection and citation, Research Plan and its components, Methodology (Experimental design / Field data collection). Data presentation and interpretation. Drawing conclusions, Writing skills - Preparation of research report, presentations, writing grant proposals.

UNIT V **(18 hrs)**

Thesis and Dissertation: components-title, certificate, declaration, acknowledgements, contents- list of tables, figures, plates & abbreviations, Introduction, Review of literature, Materials and methods- Results- Presentation of data-Tables, figures, maps, graphs, photographs-Discussion- Summary, Bibliography/References and Appendix. Research Ethics and Legal issues. Plagiarism checking and their impact on publications.

TEXTBOOKS

1. Biju Dharmapalan, *Scientific Research Methodology*. Narosa Publising House, New Delhi. 2012
2. Kannan,K. *Hand book of Laboratory culture media, reagents, stains and buffers* Panima publishing corporation, New Delhi, 2013.
3. Gurumani, N. *Research Methodology for Biological Sciences*. MJP Publishers, Chennai 2010
4. Arora P.N. Malhan P.K.. *Biostatistics*. Publishing House Delhi, 1996.
5. Kumar, P.S.G.. *Research methods and statistical techniques*. B.R. publishing Academy, Udaypur, 2004.
6. Kothari,C.R. *Research Methodology- Methods and Techniques*, New Age Publication, Wiley Eastern, 2004.

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1. Holmes, D, Mooley, P and Dine, D. *Research Methods for the Biosciences*. Oxford University Press, New York, 2006.
2. Kumar Ranjit. *Research Methodology. A step by step Guide for Beginners*. Singapore, Pearson Education, 20155.
3. Banerjee, P.B. *Introduction to Biostatistics*. S.Chand & Company Pvt. Ltd., 2014.
4. Bhattacharya, D.K. *Research Methodology.* Excel Books publication, New Delhi, 2013.
5. Harborne J.B. *Phytochemical Methods - A Guide to Modern Technique of Plant Analysis.*, Champan & Hall, UK, 1998.
6. Kothari, C.R. and Garg, G. *Research Methodology: Methods and Techniques*. New Age International Publishers, New Delhi, 2014.

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2. https://iiscs.wssu.edu/drupal/node/4673
3. https://nu.libguides.com/biostatistics
4. https://newonline_courses.sciences.psu.edu/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - VI: CELL AND MOLECULAR BIOLOGY (21PBYC22)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT: MARKS: 40**
CREDITS : 5 **EXT.MARKS : 60**
DURATION : 90 hrs **MAX.MARKS: 100**

Preamble

This course introduces the learners to the structure and function of Cells, bio molecules, cellular development and advances in cell biology.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline about the structure and function of Cells
CO2[K2]: explain the knowledge of advances in cell biology
CO3[K3]: develop the knowledge of cell organelles, Prokaryotic and Eukaryotic cells
CO4[K4]: distinguish between chloroplast and mitochondria genome organization
CO5[K5]: justify the study of mitosis and meiosis in cell divisions

CO-PO Mapping Table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	3	2	-	1	-
CO2[K2]	3	2	2	-	-	-	-
CO3[K3]	3	2	2	1	-	1	1
CO4[K4]	3	2	3	1	2	1	1
CO5[K5]	3	2	2	2	2	-	1
Weightage of the course	15	11	12	6	4	3	3
Weighted percentage of Course contribution to Pos	**5.68**	**5.12**	**6.19**	**4.08**	**4.3**	**3.66**	**3.23**

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

UNIT I **(18 Hrs)**

Ultra structure of plant cell: structure and functions of cell organelles; ER, GC, Nucleus, Ribosomes, Lysosomes and their function. Cell cycle and its regulation; Endo symbiotic theory.

UNIT II **(18 Hrs)**

Molecular biology: structure, organization and types of Plasma membrane; Glycoconjugates and proteins in membrane systems; Ion transport; Na+ / K+ ATPase; molecular base of signal transduction in plants.

UNIT III **(18 Hrs)**

Epigenetics: Histone Modification. Central dogma and structure of DNA & RNA. Chromosome structure in eukaryotes; levels of DNA packaging; repeat sequences in DNA; Mechanisms and its types –DNA Replication - rolling circle replication.

UNIT IV **(18 Hrs)**

Steps involved in transcription and Translation, Post transcriptional and Post translational Modification. Mutation: spontaneous and induced mutation; molecular basis of mutations; mutation by radiation, chemicals and transposable elements. DNA damage and repair mechanism; light dependent repair, excision repair and error. Transposans and its uses.

UNIT V **(18 Hrs)**

Regulation of gene expression in prokaryotes-Operon concept, regulation of Lac, regulation of gene expression in eukaryotes, RUBP carboxylase gene in plants. RNAs in gene regulation-RNAi, SiRNAs & MiRNAs.

TEXTBOOKS

1. Lodish, H. Berk A, Zipursky SL. *Molecular Cell Biology*, 4th edition., W.H. Freeman, New York, 2000.
2. Ajay Paul. *Cell Biology and Molecular Biology*. Books & Allied Ltd., 2011.
3. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, Keith; Walter. *Molecular Biology of the Cell*. Garland Science, New York and London, 2002.

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1. De Robertis, E.D.P., and De Robertis, E.M.F. *Cell and Molecular Biology*. Lippincott Williams and Wilkins, Philadelphia. 8th edition, 2006.
2. Cooper, G.M., and Hausman, R.E. *The Cell: A Molecular Approach*. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA. 5th edition, 2009.

3. Karp, G. *Cell and Molecular Biology Concepts and Experiments*. John Wiley and Sons.Inc.6th Edition, 2010.

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1. https://onlinecourses.swayam2.ac.in/cec19_bt12/preview.
2. https://onlinecourses.nptel.ac.in/noc21_cy15/preview.
3. https://onlinecourses.swayam2.ac.in/cec20_ma13/preview.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE VII: PLANT BIOTECHNOLOGY AND BIOINFORMATICS (21PBYC23)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with plant molecular biology and genetic engineering applications and also Plant Tissue Culture and Bioinformatics tools applied in plant Biotechnology.

Course Outcomes (CO)

On successful completion of the practical course, the learners will be able to
CO1[K1]: describe the molecular biology of plasmid and plant genome
CO2[K2]: interpret the genetically modified DNA and gene transfer method
CO3[K3]: demonstrate and validate the GM plants
CO4[K4]: examine the tissue culture media and culturing of organs or whole plant
CO5[K5]: assess the biological sequence and construct phylogenetic tree

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	-	-	2	-	-	-
CO2[K2]	3	2	3	-	-	-	-
CO3[K3]	3	3	2	2	2	2	-
CO4[K4]	2	3	2	2	3	2	2
CO5[K5]	2	2	3	2	2	2	2
Weightage of the course	12	10	10	8	7	6	4
Weighted percentage of Course contribution to POs	**4.55**	**4.65**	**5.15**	**5.44**	**7.53**	**7.32**	**4.3**

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

UNIT I **(18 hrs)**

Introduction to plant Biotechnology; Bacterial plasmid DNA and plant gDNA, their significances and importance. *Agrobacterium* and crown gall tumours, Ti plasmid and Ri plasmid. Molecular biology of plant pathogen interactions. plant defence mechanism – Pathogen related Proteins (pR Proteins) – Chitinase and peroxidase. Cloning and Binary vectors.

UNIT II **(18 hrs)**

Plant transformation vector, Molecular mechanism of T-DNA transfer, Gene transfer methods – *Agrobacterium* mediated plant Transformation, Chemical and Physical methods and direct gene transfer method by Electroporation, Microinjection, Microprojectile bombardment. Physical methods – Genegun.

UNIT III **(18 hrs)**

Transgenic technology and sustainable agriculture, Biosafety concerns with transgenic technology, History of transgenic development across the world, Major concerns with implementation of transgenic technology in India. Applications as Pest resistant (Bt-cotton); herbicide resistant plants (Round Up Ready soybean); Transgenic crops with improved quality traits in major crops (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug).

UNIT IV **(18 hrs)**

Historical perspective; Formulation of nutrient media; Sterilization, role of vitamins and hormones; Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Organ culture, Embryo culture, Anther and triploid culture, Callus culture, Protoplast isolation, culture and fusion; Tissue culture applications including micropropagation, androgenesis, production of virus free plants, secondary metabolite production, haploids, triploids and hybrids and germplasm conservation.

UNIT V **(18 hrs)**

Introduction to Bioinformatics: Definition, Objectives; Biological Databases-Primary, Secondary and Specialized Databases. Nucleic Acid Databases-NCBI, DDBJ, and EMBL: Protein Databases-PDB, PIR, And SWISSPROT. Structure Elucidation -SCOPE and CATH. Online Search Tools-BLAST/FASTA. Sequence Retrieval Method from Different Databases. Sequence Analysis-Local Vs Global: Multiple Alignment: Phylogenetics – introduction, phenogram, cladogram. Construction of phylogenetic tree. ORF prediction for plant gene identification.

TEXTBOOKS

1. Dubey, R C. *A Textbook of Biotechnology*. S. Chand Publishing, 5th edition 2014.
2. Chawla, H.S. *Introduction to Plant Biotechnology*. Science Publishers, 3rd edition 2014.
3. Erica E. Benson. *Plant Conservation Biotechnology*. Taylor and Francis group, London, 2003.
4. Rastogi, S. C. Namita Mendiratta , Parag Rastogi. *Bioinformatics: Methods And Applications*. PHI Learning pvt ltd., 2013.

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1. Heddwyn Jones. *Plant Gene Transfer and Expression Protocols*. Humana Press, 2013.
2. Bhojwani , S.S. and Razdan, M.K. *Plant Tissue Culture: Theory and Practice*. Elsevier, 1996.
3. Rudolf Endress. *Plant Cell Biotechnology*. Springer Berlin Heidelberg, 2013
4. Gupta, P.K. *Biotechnology and Genomics*. Rastogi publication, 2004.
5. Indra K. Vasil, Trevor A. Thorpe. *Plant Cell and Tissue Culture*. Springer Science, 2013.
6. David Edwards. *Plant Bioinformatics, Methods & Protocols.* Springer publication, 2015.

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2. https://www.loc.gov/rr/scitech/tracer-bullets/biotechnologytb.html
3. https://molbiol-tools.ca/
4. https://www.expasy.org/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
CORE COURSE - VIII: PRACTICAL: INSTRUMENTATION TECHNIQUES, BIOSTATISTICS, CELL AND MOLECULAR BIOLOGY, PLANT BIOTECHNOLOGY AND BIOINFORMATICS (21PBYC2P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course provides hands on techniques to observe mitosis and meiosis cell division and also isolation of different molecules from the bacterial and plant cells and enables the learners to work with different instruments and analysis of nucleotide and protein sequences using Bioinformatics tools.

Course Outcomes (CO)

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

CO1[K2]: explain the cell components and observation of cell organelles

CO2[K3]: demonstrate the molecules isolated from cell

CO3[K4]: compare the sequence of different plant gDNA and bacterial plasmid and gDNA for making recombinant DNA

CO4[K5]: access the sequence retrieval tools and comparison tools.

CO5[K6]: assemble the plant genome & microbes by using Bioinformatics tools

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	-	-	-	-	-	-
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	10	8	8	9	6	6
Weighted percentage of Course contribution to POs	**4.92**	**4.65**	**4.12**	**5.44**	**9.68**	**7.32**	**6.45**

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

Experiments:

Instrumentation Techniques

1. Separation techniques - Gradient centrifugation & Chromatography
2. Spectrophotometric techniques
3. ELIZA reader
4. Lyophilizer
5. Sonicator

Cell Biology

1. Observation of Mitosis in Root tip squash
2. Observation of Meiosis in Anthers
3. Separation of plant pigments by chromatographic technique

Molecular Biology

1. Isolation of plant genomic DNA
2. Agarose gel electrophoresis for visualization of DNA
3. Isolation of Bacterial chromosomal DNA
4. Isolation of Bacterial plasmid.
5. Gene amplification by PCR technique
6. Restriction enzyme digestion of PCR products

Plant Biotechnology

1. Preparation of Immobilized cells
2. Molecular Diversity analysis - Plants and Bacteria
3. Preparation of Cybrids and synthetic seeds
4. Demonstration of Plant Tissue Culture techniques.

Bioinformatics

1. Sequence retrieval from Database – Nucleic acid and protein.
2. Retrieval of protein structure from Database.
3. Sequence alignment and comparison – BLAST, Clustal W.
4. ORF prediction.
5. Gene expression analysis in plants and Microbes.

REFERENCES

Books

1. Senthilkumar Balakrishnan & Senbagam Duraisamy. *Practical Microbiology – A Laboratory Manual*. 2013. Panima Publishing Corporation, New Delhi, India
2. Dubey, R C. *A Textbook of Biotechnology*. S. Chand Publishing. 2014
3. Mohammed Iftekhar, Mohammed Rukunuddin Ghalib. *Bioinformatics Practical Manual*. 2015. Create Space Independent Publishing Platform.
4. Kailash Chandra Samal, Gyana Ranjan Rout. *Bioinformatics Practical Manual*. 2014.

Web Sources

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2. https://openstax.org/details/books/microbiology?Instructor%20resources
3. https://www.loc.gov/rr/scitech/tracer-bullets/biotechnologytb.html

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - II
NON MAJOR ELECTIVE COURSE: HOME GARDENING (21PBYN21)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the students to study the different types of gardens, establishment of techniques, usage of seasonal vegetables, cultivation and maintenance of home garden.

Course Outcomes (CO)

On successful completion of the course, the learners will 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	-	2	-	1	-
CO2[K2]	2	2	-	2	-	2	-
CO3[K3]	3	-	2	1	2	2	2
CO4[K4]	3	2	2	2	2	1	-
CO5[K5]	2	1	-	2	-	1	1
Weightage of the course	12	7	4	9	4	7	3
Weighted percentage of Course contribution to Pos	**4.55**	**3.26**	**2.06**	**6.12**	**4.3**	**8.54**	**3.23**

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

UNIT I **(18hrs)**

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 **(18 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 **(18 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 **(18 hrs)**

Cultivation Hydroponics, cultivation of tomato through hydroponics, advantages of hydroponics. Terrace garden establishment and it uses. Vertical and Roof top garden.

UNIT V **(18 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
3. https://www.youtube.com/watch?v=cLM-Rbju71

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - IX: MICROBIOLOGY AND PLANT PATHOLOGY (21PBYC31)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the classification and identification cultural techniques, morphology and biochemical characters of microorganism and fungal plant pathogens.

Course Outcomes (CO)

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

CO1[K1]: describe the cultural characters of microorganism
CO2[K2]: classify and identify the bacteria by morphology, biochemical methods
CO3[K3]: discover the plant pathogenic organism and treat the plants
CO4[K4]: inspect the symptoms and apply of control measures
CO5[K5]: justify suitable control measure for plant disease management

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	2	-	-	2
CO2[K2]	2	2	2	2	-	-	2
CO3[K3]	2	2	2	1	1	1	2
CO4[K4]	2	2	2	1	1	1	1
CO5[K5]	2	2	2	1	1	-	1
Weightage of the course	10	10	10	7	3	2	8
Weighted percentage of Course contribution to POs	**3.79**	**4.65**	**5.15**	**4.76**	**3.23**	**2.44**	**8.6**

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

UNIT I **(18 hrs)**

History of Microbiology – contributions of Anton Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch and his postulates. General characteristics of bacteria - morphological, cultural characteristics. Ultra structure of Bacterial cell, capsule, flagella, pili, cell membrane, nucleoid, mesosome, ribosomes, plasmids. Endospore - structure, sporulation and its significance.

UNIT II **(18 hrs)**

Classification of Bacteria according to Bergeys Manual of systematic Bacteriology, classification – phonetic, numerical taxonomy and phylogenetic method. Growth of bacteria, generation time, measurement of bacterial growth, Nutritional types of bacteria, growth inhibitors, bacteriostatic & antibiotic agents. Staining techniques – simple and differential staining.

UNIT III **(18 hrs)**

Fungus – Morphological, Biochemical and Molecular tools for identification and detection, RAPD and ITS analysis. Mycorrhiza helper bacteria (MHB). Biotechnological applications of fungi - Production of antibiotics. Plant viruses – Classification based on the morphology and genetic material. Cultural methods, multiplication of Lytic and Lysogenic cycle.

UNIT IV **(18 hrs)**

Classification and symptoms of plant diseases. Plant – pathogen interaction, structural changes, Causal factors and Control measures of the following Plant diseases: Sheath blight of rice, Banana leaf spot, Black rust of wheat, Bacterial leaf spot, Bacterial soft rot and Bacterial blight.

UNIT V **(18 hrs)**

Structure, Transmission & control measures of plant viruses - Banana bunchy top, Para Retro Virus and Tobacco Mosaic Virus (TMV), Maize streak virus and tomato pseudo-curly top virus. Bacteriophages – Structural and pathogenic features. Virions and Prions.

TEXTBOOKS

1. Sharma, P. D. *Microbiology and Plant Pathology*. Rastogi Publication. 3rd edition. 2016.
2. Ananthanarayanan and J.Panicker, *Text book of Microbiology*, Orient Long Publishers, Eighth edition, 2005.
3. Rajan, S. and Selvi Christy. *Experimental procedures in Life Sciences*. Anjanaa Book house. 2012.

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1. Prescott L.M., J.P. Harley and D.A. Klein. *Microbiology.* McGraw Hill, Boston. Ninth edition, 2013.
2. Pelzer M.J., E.C.S. Chan and N.R. Kreig. *Microbiology*. McGraw Hill Inc., New York, 1993.
3. Gerard J. Tortora, Berdell R. Funke, Christine and L. Case. *An Introduction of Microbiology*. Benjamin Cummings, U.S.A. 2001.
4. Roger Hull. Matthews' Plant Virology, Fourth Edition 4th Edition. 2001.

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1. https://serc.carleton.edu/microbelife/topics/index.html
2. https://openstax.org/details/books/microbiology?Instructor%20resources
3. https://www.loc.gov/rr/scitech/tracer-bullets/biotechnologytb.html

KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - X: GENETICS AND EVOLUTION (21PBYC32)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the principles of Mendelian laws, mutation in genetics, hybridization concepts in plant, genetic recombination process and species origin

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: define the principles and concept of Mendelian laws
CO2[K2]: explain mutation and population genetics
CO3[K3]: determine the sex linked inheritance
CO4[K4]: examine genetic recombination at molecular level
CO5[K4]: analyze the origin of the human species

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[K4]	3	2	2	1	-	2	0
Weightage of the course	15	10	10	9	4	5	2
Weighted percentage of Course contribution to Pos	**5.68**	**4.65**	**5.15**	**6.12**	**4.3**	**6.1**	**2.15**

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

UNIT I **(18 hrs)**

Mendelian law of inheritance principles, multiple alleles; Gene interaction; dominant epistasis (12:3:1) recessive epistasis (9: 3: 4), duplicate dominant gene (15: 1) and Duplicate recessive gene (9:7), Inheritance of quantitative characters.

UNIT II **(18 hrs)**

Recombination genetics: methods of genetic recombination conjugation transformation and transduction in prokaryotic cell; crossing over, linkage maps, conventional and molecular theories of crossing over; cytological basis of crossing over in corn; position effect and gene conversion, self sterility; male sterility.

UNIT III **(18 hrs)**

Cytogenetics: cytogenetics of polyploids and aneuploids, haploid plastids, cytogenetic value, sex chromosome, sex determination and sex linked inheritance, chromosomal aberration (Genetic level). Mutation: types, mutagenic agents – physical and chemical mutagens, reverse and suppressed mutations. Cytoplasmic inheritance. Extra chromosomal inheritance of mitochondrial and chloroplast genome

UNIT IV **(18 hrs)**

Population genetics: Micro evolution, frequency, speciation and variation; Hardy-Weinberg law; Application of Hardy-Weinberg principles. Migration, Random drift, Genetic Load and Founder effect.

UNIT V **(18 hrs)**

Evolution: Evolution of biosphere cytogenetic basis of variation; natural selection of speciation and further progress in evolution: modern synthetic theories on evolution. Evolution of sex chromosomes, origin of the sex chromosome mechanisms

TEXTBOOKS

1. Verma P.S and V.K Agarwal. *Genetics.* S.Chand and Co, New Delhi, 1998
2. Alice Marcus. *Genetics.* MJP Publishers, Chennai, 2009.
3. James F Crow and Motto Gimura. *An introduction to population genetics.* Oxford University Press, 2008.

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1. Glick, B.R., Pasternak, J.J. *Molecular Biotechnology - Principles and Applications of recombinant DNA.* ASM Press, Washington, 2003.
2. Pevsner, J. *Bioinformatics and Functional Genomics.* John Wiley and Sons. II Edition, 2009.
3. Gupta, P.K. *Genetics*. Rastogi Publication Meerut, 2000.

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1. https://www.youtube.com/watch?v=qUSoy7Pn6To
2. https://www.youtube.com/watch?v=c1inxj14KU8
3. https://www.youtube.com/watch?v=-m_OM7cr8DI

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - XI: BIOCHEMISTRY (21PBYC33)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the structural and functional properties of Enzymes, proteins, carbohydrate and lipids with its biosynthesis and its metabolic reactions.

Course Outcomes (CO)

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

CO1[K1]: outline the fundamentals of the classification, significant properties and functions of different biomolecules

CO2[K2]: illustrate the metabolism of biochemical pathways and the mechanism of action

CO3[K3]: formulation of specific chemical buffer solution for the sensitive biochemical reaction

CO4[K4]: analyze the process of biomolecule production

CO5[K5]: compare the metabolism and modify accordingly.

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	**4.55**	**4.65**	**4.64**	**6.8**	**8.6**	**3.66**	**6.45**

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

UNIT I **(18 hrs)**

Concepts of pH, buffers and its biological importance. Thermodynamics and its principles in biology, Dissociation and association constants, Concept of free energy and standard free energy, energy rich bonds. Structure, functions and Classification of Carbohydrate.

UNIT II **(18 hrs)**

Proteins: Classification and structure folding and conformational of aminoacids, peptides and polypeptides, classification of Proteins based on structure and function. Metabolism of aminoacids. Essential and Non essential amino acids.

UNIT III **(18 hrs)**

Enzymes: classification and nomenclature of enzymes, concept of active site, mechanism of enzyme action; Michaelis-Menton equation and KM value, Enzyme modifiers - activators, inhibitors, allosteric regulation. Isozyme.

UNIT IV **(18 hrs)**

Metabolism of lipids: Biosynthesis of fatty acid; Oxidation of fatty acid and its bioenergetics; palmitic acid unsaturation; biosynthesis of cholesterol; Importance of cholesterol and plant lipids.

UNIT V **(18 hrs)**

Chemistry and classification of vitamins, hormones and alkaloids: vitamins as co-enzymes; chemistry and biosynthesis of hormone - thyroxine, catechalamines, steroidal hormones. Biologically important alkaloids (Vincristine, Ajmalicine, Nicotine).

TEXTBOOKS

1. Satyanarayana, U. *Biochemistry*. 5th Edition, Books and Allied (p) Ltd. 2019.
2. Jain, J.I. *Fundamentals of Biochemistry*. 6th revision. S. Chand & Co. 2005.

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1. Voet and Voet. *Principles of Biochemistry.* 4th Edition John Wiley. 2014
2. Lehninger. *Principles of Biochemistry*. 7th Edition. International Edition. 2017.
3. Campbell, M.K. *Biochemistry.* 8th Edition, Cengage Learning Publisher, New York. 2015.
4. Lubert Stryer, Jeremy M. Berg, John L. Tymoczko. *Biochemistry*. 7th Edition. W. H. Freeman Publisher, New York. 2015.

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1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6822018/.
2. https://www.wiley.com/legacy/college/boyer/0470003790/index.htm.
3. https://www.ncbi.nlm.nih.gov/books/NBK21177/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
CORE COURSE - XII: PRACTICAL: MICROBIOLOGY, PLANT PATHOLOGY, GENETICS AND BIOCHEMISTRY (21PBYC3P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course provides hands on experience on cultural techniques, morphology and biochemical characters of microorganism and fungal plant pathogens.

Course Outcomes (CO)

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

CO1[K2]: differentiate the microorganisms by morphological and biochemical characters

CO2[K3]: discover the plant diseases and pathogens

CO3[K4]: compare the plants diseases and their symptoms

CO4[K5]: measure the bacterial population of given sample by plating techniques

CO5[K6]: solve the monohybrid & dihybrid cross problems in genetics.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	-	-	-	-	-	-
CO2[K3]	3	1	1	2	2	1	-
CO3[K4]	3	3	2	2	1	1	3
CO4[K5]	2	3	2	2	3	1	2
CO5[K6]	3	3	2	2	1	1	1
Weightage of the course	14	10	7	8	7	4	6
Weighted percentage of Course contribution to POs	**5.3**	**4.65**	**3.61**	**5.44**	**7.53**	**4.88**	**6.45**

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

Experiments:

Microbiology

1. Sterilization techniques.
2. Preparation of culture Media - Nutrient Agar (NA) and Potato Dextrose Agar (PDA)
3. Isolation of bacteria from soil and water
4. Isolation of endophytic fungus
5. Plating techniques – Pour plate, Spread plate, Streak plate
6. Staining of Bacteria – simple, gram staining and spore staining.
7. Hanging drop technique.
8. Biochemical test: IMViC test

Plant Pathology

1. Staining and Observation of the following fungal phytopathogens:
   R. solani, S. rolfssi, F. oxysporum, M. phaseolina, A. alternata
2. Observation of infected plant specimens such as Tikka disease, Citrus canker, TMV and Red rot of Sugar cane
3. Microscopic observation of fungal mycelia using Lacto phenol Cotton Blue.

Genetics

1. Solving problem related to Monohybrid cross
2. Solving problem related to Dihybrid cross, incomplete dominance
3. Solving problem related to test and backcross
4. Solving problem related to multiple gene interaction – Blood grouping.

Biochemistry

1. Estimation of glucose starch, Protein glucose in the and Lipids in Plant tissue
2. Qualitative test for carbohydrates, Lipids, Proteins and Amino acids.
3. Determination of enzyme activities- Amylase Nitrate reductase and Peroxidase

REFERENCES

Books

1. Senthilkumar B & Senbagam D. *Practical Microbiology - A Laboratory Manual*. 2013. Publisher: Panima Publishing Corporation, New Delhi, India
2. Bendre & Kumar. *A text book of Practical Botany II.* 2010. Rastogi Publications.

Web Sources

1. http://istl.org/15-spring/internet2.html
2. https://openstax.org/details/books/microbiology?Instructor%20resources
3. https://www.loc.gov/rr/scitech/tracer-bullets/biotechnologytb.html

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSE - II: BIODIVERSITY AND CONSERVATION (21PBYO31)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to various medicinal plants and its conservation and utilization of threatened plants.

Course Outcomes (CO)

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

CO1[K1]: state the vegetation and their relationship with the ecosystem

CO2[K2]: classify the environmental biology in ecosystem

CO3[K3]: develop the indigenous knowledge, biopiracy and bio prospecting

CO4[K4]: analyze the cause and consequences of loss of biodiversity, threats and conservations.

CO5 [K4]: simplify the *in situ* conservation and *ex situ* conservation

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	-	-
CO2[K2]	3	2	2	1	-	2	-
CO3[K3]	2	3	2	1	-	2	2
CO4[K4]	2	2	2	1	1	-	1
CO5[K4]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to POs	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Biodiversity; definition, levels of biodiversity; genetic, species and ecosystem diversity, Hotspot concept and hot spot in India. values of biodiversity: Endemic diversity.

UNIT II **(18 hrs)**

Biological Diversity, Concept and levels, role of Biodiversity in Ecosystem, function and Stability, speciation and extinction, IUCN categories of threat, terrestrial Biodiversity hot spot.

UNIT III **(18 hrs)**

Cause and consequences of loss of biodiversity, Impact of exotic species on local biodiversity; deforestation; cause for the extinction of species; Red data book and its importance; key stone species and their significance in an ecosystem function.

UNIT IV **(18 hrs)**

Conservation – need for conservation – *In situ* conservation: sanctuaries, national parks, biosphere reserves – *Ex situ* conservation: gene banks and cryopreservation- Role of indigenous people in conservation- human- animal conflicts. Role of National and International institutions in conservation of biodiversity.

UNIT V **(18 hrs)**

Bioprospecting. Indigenous knowledge, Biopiracy, Intellectual property rights and its impact on biodiversity; Impact of new technologies: biotechnology and genetic engineering.

TEXTBOOKS

1. Kumaresan, V. and N. Arumugam. *Plant Ecology and phytogeography*. Saras Publication, Nagercoil, 2015.
2. Erica E. Benson. *Plant Conservation Biotechnology*. Taylor and Francis group, London, 2003.
3. Begon, M. Harper, J.L. and Townssend, C.R. *Ecology*. Backwell Science, Cambridge, USA, 1996.

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1. Odum, E.P. *Fundamentals of Ecology*. Saunders, Philadelphia, 1971.
2. Muller Dombosis. Dand Ellenberg, H. *Aims and methods of vegetation Ecology*. Wiley, New York, 1974.
3. Odum, E.P., *Basic Ecology*, Saunders, Philadelphia, 1983.
4. Ludwing, J. and Reynolds, J.F. *Statistical Ecology*. John Wiley and Sons, 1988.

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1. https://byjus.com/biology/biodiversity-conservation/#:~:text=Biodiversity%20conservation%20is%20the%20protection,conservation%20has%20three%20main%20objectives%3A&text=Sustainable%20utilization%20of%20species%20and,systems%20and%20essential%20ecological%20processes.
2. https://byjus.com/biology/red-data-book/
3. https://www.iucnredlist.org/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSE - II: PALYNOLOGY AND POLLINATION BIOLOGY (21PBYO32)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with the morphology and biology of pollen and the salient features of Pollination Biology

Course Outcomes (CO)

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

CO1[K2]: explain the characters of pollen grains and features of Pollination biology.

CO2[K3]: utilize the knowledge on Pollination and breeding system in Angiosperms

CO3[K4]: distinguish the types of pollen, breeding system & self incompatibility in plants

CO4[K4]: analyse the types & viability of pollen, sexual reproduction and sexual incompatibility in plant system.

CO5[K5]: evaluate the Palynology, breeding system & pollination of Angiosperm plants

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	2	-	-
CO2[K3]	3	2	2	1	-	2	-
CO3[K4]	2	3	2	1	-	2	2
CO4[K4]	2	2	2	1	1	-	1
CO5[K5]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to Pos	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Palynology: definition, scope and importance; Pollen productivity, Pollen dispersal, Pollen morphology: Pollen units, Polarity, Symmetry, Shape, Size, Apertural patterns, and Exine stratification, NPC system of apertural classification; Application of Palynology. Allergic Effects of Pollen Grains.

UNIT II **(18 hrs)**

Cell Biology of Pollen grains, Pollen kit, Pollen calendar, Circadian rhythms of Pollen Emission. Pollen Viability-FCR Test, TTC Test and DAB Test; Pollen Fertility-Acetocarmine, Alexandar staining Test. *In Vitro* and *In Vivo* Pollen Germination.

UNIT III **(18 hrs)**

Breeding Systems in Plants: vectors involved in pollination, double fertilization; *in-vitro* fertilization, Apomixis and its types- Agamospermy, Diplospory, Apospory, Adventive Embryony. Polyembryony- types and its practical application.

UNIT IV **(18 hrs)**

Pollination Biology: pollen-stigma interactions and fertilization, Self Incompatibility: Heteromorphic system- Distyly and Tristyly; Homomorphic System- Gametophytic Self Incompatibility and Sporophytic self Incompatibility. Recognition Reaction, Rejection Reaction. Stigma Surface Inhibition and Stylar Inhibition.

UNIT V **(18 hrs)**

Methods to Overcome the Self Incompatibility: Mixed, Bud, Stub, End-of-Season Pollination, Intra Ovarian and Test Tube Pollination, Irradiation, Heat and Chemical Treatment and Parasexual Hybridization. Advertisement and rewards.

TEXTBOOKS

1. Singh, Pande and Jain, *Plant Resource utilization, Palynology and Biostatistic*, Rastogi Publishers, Meerut, 2018.
2. Shivanna, K.R. and Johri, B.M., *The angiosperm pollen: Structure and Function*, John Wiley publication, 2016.
3. Bhattacharya, K., Majumdar, M.R. and Bhattacharya, S.G. *A textbook of Palynology*, New Central Book Agency, New Delhi 2017.
4. Yogesh Dabgar, *Pollination Biology*, Neha Publishers and Distributors, 2011.

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1. Bhojwani, S.S. and Bhatnagar, S.P. *The embryology of angiosperms*, Vikas publication house, New delhi, 1974.
2. Maheswari, P. *An introduction to the embryology of angiosperms*, TMH limited New Delhi, 1971.
3. Nair, P.K.K. *Pollen Morphology of Angiosperms – A Historical and Phylogenetic study*. Barnes and Noble, New York, 1970.
4. Erdtman, G. *Pollen Morphology and Plant Taxonomy: Angiosperms*. Hafner Publishing Company, New York 1966

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2. https://www.floridamuseum.ufl.edu/paleobotany/palynology/#:~:text=Palynology%20is%20the%20study%20of,both%20living%20and%20fossil%20form.
3. https://sfb.univie.ac.at/en/research/pollination-biology/
4. https://pubmed.ncbi.nlm.nih.gov/11814052/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - III
ELECTIVE COURSE - II: RECENT ADVANCES IN BOTANY (21PBYO33)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to recent advances in Botany like Nanotechnology, Phytochemistry and Plant Genomes.

Course Outcomes (CO)

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

CO1[K1]: describe the recent advances in the area of Botany
CO2[K1]: define the Plant Genome
CO3[K2]: infer the plant gene and genome for functional analysis
CO4[K3]: analyze Phytocomponents and Nano particles in plants
CO5[K4]: simplify procedure to isolate the metabolites from the medicinal plants

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	2	-	-
CO2[K1]	3	2	2	1	-	2	-
CO3[K2]	2	3	2	1	-	2	2
CO4[K3]	2	2	2	1	1	-	1
CO5[K4]	3	2	2	1	-	2	2
Weightage of the course	13	11	10	5	3	6	5
Weighted percentage of Course contribution to POs	**4.92**	**5.12**	**5.15**	**3.4**	**3.23**	**7.32**	**5.38**

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

UNIT I **(18 hrs)**

Plant Genomics and Proteomics: Introduction – Plant Genome - Structural genomics - genome sequencing strategies - Functional genomics – genome annotation, gene expression using microarrays, functional annotation of genes. Introduction to proteomics – Overview of Protein structure Relationship between Protein Structure and Function- Outline of a Typical Proteomics Analytical tools in proteomics. Protein-Protein Interactions.

UNIT II **(18 hrs)**

Computational Biology: Introduction, aim and importance of Computational Biology – Database and Mining – Genomics, Transcriptomics and Metabolomics. Sequence analysis – SNP, Mutation, ORF search and identification. Primer designing- principle, methods and tools.

UNIT III **(18 hrs)**

Phytochemistry: Introduction to Phytochemicals; Alkaloids, Phenolic compounds: Anthocyanins, carotenoids, flavonoids, tannins Hydroxycinnamic acids – Xanthophylls plants with phytochemicals, Organic acids, lipids and their related compounds: plant acids, Fatty acids and Lipids. Sugars and their derivatives. Extraction of phytochemicals – Developing new drugs from Ethnomedicines.

UNIT IV **(18 hrs)**

Pharmacognosy: Introduction – history – Indian System of medicine – natural sources of Drugs – Crude drugs – Classification of crude drugs – Collection and Processing of crude drugs – Phytoconstituents of therapeutic value – Histochemical tests for phytochemicals – Drugs containing carbohydrates/ glycosides/ lipids/ Volatile oils/ Resin/ Alkaloids/ Tanninis – Analytical pharmacognosy – Anatomical features of selected medicinal plants (Piper, Datura and Strychnos).

UNIT V **(18 hrs)**

Nanobiotechnology: Overview –Biomaterials – types and its applications, biocompatibility – Fabrication and Characterization of nanostructures –Biomedical applications – Health and Environmental impacts. Synthesis of nanoparticles - plants and microbes.

TEXTBOOKS

1. Middha, S.K., Usha, T. And H.P. Prashanth Kumar. *Bioinformatics*. College Book House, Bangalore. 2012.
2. Sahu, P.K. *Research Methodology*: *A Guide for Researchers in Agricultural Science, Social Science and other related fields*. Springer, New Delhi. 2013.
3. Shah.B. and Seth.A. *Text book of Pharmacognosy and Phytochemistry*. Elsevier India Pvt. Ltd. New Delhi. 2010.
4. Thiagarajan, B. and Rajalakshmi, P.A. *Computational biology*. MJP Publishers, Chennai. 2009.
5. Agarwal, G.K. and Rakwal, R. *Plant Proteomics Technologies; Strategies and Applications*. John Wiley & Sons, Inc, USA. 2008.

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1. Roseline, A. *Pharmacognosy*. MJP Publishers, Chennai. 2011.
2. Bernard Rosner. *Fundamentals of Biostatistics*. Brooks, Boston, USA. 2010.
3. Balaji, S. *Nanobiotechnology*. MJP Publishers, Chennai. 2010.
4. Ranjitha Kumari, B.D. *Plant Proteomics*. APH Publishers, New Delhi. 2008.
5. Sanaj.J. and Thelen, J.J. *Plant proteomics*. Springer, New York. 2007.
6. Mahajan. B.K. *Methods in Biostatistics*. Jay Pee Brothers Medical Publishers (P) Ltd. New Delhi. 1997.

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1. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/phytochemistry
2. https://pubs.acs.org/doi/full/10.1021/bk-2016-1220.ch001#:~:text=Nanotechnology%20can%20be%20defined%20as,and%20possibly%20produce%20new%20products.&text=A%20possible%20concern%20is%20the,of%20some%20of%20these%20products.
3. https://www.sciencedirect.com/topics/medicine-and-dentistry/pharmacognosy

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme – M.Sc. Botany
SEMESTER - III
SELF-PACED LEARNING (SWAYAM COURSE): FORESTS AND THEIR MANAGEMENT (21PBYM31)
(From 2021 - 2022 Batch onwards)

CREDITS : 3 **EXT. MARKS : 100**
DURATION: 12 Weeks

Preamble

This course provides the learners with an opportunity for a lifelong learning by meeting the demand in terms of knowledge, skills, and competencies.

Course outcome (CO)

On successful completion of this course learners will be able to

CO1[K1]: identify the background and the key words in Forests and their Management

CO2[K2]: demonstrate independent and self-paced learning for clear understanding of the concept

CO3[K3]: develop computer and communication skills to broaden their knowledge in the course

CO4[K3]: use high quality reading resources, communication tools and technology to send assignments and to take up test

CO5 [K4]: analyze critically and apply technical skills to comprehend the ideas or theories in the video lectures

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	2	-	-	2
CO2[K2]	2	2	2	2	-	-	2
CO3[K3]	2	2	2	1	1	1	2
CO4[K3]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	-	1
Weightage of the course	10	10	10	7	03	02	08
Weighted percentage of Course contribution to Pos	**3.79**	**4.65**	**5.15**	**4.76**	**3.23**	**2.44**	**8.6**

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

COURSE LAYOUT

Week 1: Introduction
Week 2: Basics of silviculture
Week 3: Forest soils
Week 4: Forest mensuration
Week 5: Forest surveying
Week 6: Forest protection
Week 7: Silvicultural management - I
Week 8: Silvicultural management - II
Week 9: Logging and yield
Week 10: Silvicultural practices
Week 11: Newer trends in forestry
Week 12: Revision

REFERENCES

Books

1. Dan Binkley and Richard F.Fisher. *Ecology and Management of forest soils*, Wiley-Blackwell, 2012.
2. G.R. Mahajan, A.M.Latare, K.A. Chobhe. *Soil Science*. New vishal Publishers, 2010.
3. S. S. Bist, M/s Bishen singh Mahendra Pal singh. *Principles and practices of Silviculture*. first edition, 2016.
4. Bishen singh Mahendra Pal singh S.A. Wilde. *Forest soils and Forest growth*. 2009.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme – M.Sc. Botany
SEMESTER - III
SELF-PACED LEARNING (SWAYAM COURSE): APPLIED ENVIRONMENTAL MICROBIOLOGY (21PBYM32)
(From 2021 - 2022 Batch onwards)

CREDITS : 3 **EXT. MARKS : 100**
DURATION: 12 Weeks

Preamble

This course provides the learners with an opportunity for a lifelong learning by meeting the demand in terms of knowledge, skills, and competencies.

Course outcome (CO)

On successful completion of this course learners will be able to

CO1[K1]: identify the background and the key words in Applied Environmental Microbiology

CO2[K2]: demonstrate independent and self-paced learning for clear understanding of the concept

CO3[K3]: develop computer and communication skills to broaden their knowledge in the course

CO4[K3]: use high quality reading resources, communication tools and technology to send assignments and to take up test

CO5 [K4]: analyze critically and apply technical skills to comprehend the ideas or theories in the video lectures

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	2	-	-	2
CO2[K2]	2	2	2	2	-	-	2
CO3[K3]	2	2	2	1	1	1	2
CO4[K3]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	-	1
Weightage of the course	10	10	10	7	03	02	08
Weighted percentage of Course contribution to Pos	**3.79**	**4.65**	**5.15**	**4.76**	**3.23**	**2.44**	**8.6**

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

COURSE LAYOUT

Week 1: Introduction; cell elements and composition Cell and its composition, cytoplasmic membrane Prokaryotic cell division Microbes and their environmental niches Historical roots of microbiology Nucleic acids and amino acids DNA structure, replication, and manipulation Protein and its structure Regulation Microbial nutrition Microscopy: Light microscopy, 3D Imaging, AFM, Confocal scanning laser microscopy

Week 2: Microbial energetics and diversity Stoichiometry and bioenergetics Oxidation-reduction NAD, energy-rich compounds and energy storage Mathematics of microbial growth Glycolysis Respiration Citric-acid cycle Catabolic Alternatives Phototrophy, Chemolithotrophy, anaerobic respiration (Nitrate and Sulfate reduction; Acetogenesis; Methanogenesis; Metal, Chlorate, and organic electron acceptors)

Week 3: Microbial metabolism and functional diversity of bacteria Prokaryotic diversity Classical taxonomy Origin of life Tree of life Major catabolic pathways Catalysis and enzymes Energy conservation Sugars and polysaccharides, amino acids, nucleotides, lipids

Week 4: Microbial ecosystems Population, guilds, and communities Environments and microenvironments Microbial growth on surfaces Environmental effects on microbial growth

Week 5: Environmental genomics and microbial ecology; genetic exchange Environmental genomics Microbial ecology Horizontal and vertical gene transfer: Replication, Transformation Transduction

Week 6: Microbial symbiosis and virus, Mutation and its rate, Genetic recombination, Population dynamics, Virus, Viroid, Prion, Application of environmental microbes

Week 7: Investigations in environmental microbiology: sampling, detection, isolation, taxonomic and functional annotation and quantification; Introductory bioinformatics and data analysis Microbial sampling Culture based and culture independent tools Molecular biology tools: Cloning, amplification, sequencing, Case study

Week 8: Bioremediation and wastewater microbiology, Bioremediation and examples, Acid mine drainage, Enhanced metal recovery, Wastewater microbiology

Week 9: Drinking water microbiology, Drinking water microbiome and treatment, Microbial instability, Water borne microbial diseases

Week 10: Solid waste microbiology and antimicrobial resistance, Landfills, Leachate, Anaerobic degradation phases, Antimicrobial resistance

Week 11: Epidemiology and biosensors, Public health, Epidemics, Biosensors, Wearable biosensors

Week 12: Built microbiology, exposomes and bioinformatics, Exposure routes, Microbes living around us, Exposomes Basic bioinformatics, Bioinformatics tools available online

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Books

1. Bruce E. Rittmann, and Perry L. McCarty. Environmental Biotechnology: Principles and Applications. McGraw-Hill, 2001. ISBN: 0071181849. 2017.
2. Madigan, M., Bender K. S., Buckley D.H., Sattley W. M., and Stahl D.A. Brock Biology of Microorganisms. New York : Pearson, 2017. ISBN: 0134261925. 2001.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE - XIII: PLANT PHYSIOLOGY (21PBYC41)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course provides knowledge of water absorption by plants, mechanism of mineral transport by plasma membrane, the steps involved in photosynthesis, respiration and also in biological clock.

Course Outcomes (CO)

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

CO1[K1]: describe the physiological process of photosynthesis and respiration of plants

CO2[K2]: express the knowledge of phytohormones and its applications

CO3[K3]: develop the concept of water relationship and its mechanism

CO4[K4]: distinguish the photorespiration and respiration of plant cell

CO5[K5]: justify the mechanism and functions of phytochrome

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	-	-	-	-
CO3 [K3]	2	3	2	2	-	1	1
CO4 [K4]	3	2	3	2	2	1	2
CO5 [K5]	2	2	2	2	2	-	1
Weightage of the course	13	12	12	7	4	3	4
Weighted percentage of Course contribution to Pos	**4.92**	**5.58**	**6.19**	**4.76**	**4.3**	**3.66**	**4.3**

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

UNIT I **(18 hrs)**

Water Relation- Physico- Chemical Properties of Water, Theories on Membrane Permeability; Diffusion, Osmosis and Imbibitions; Plasmolysis and Deplasmolysis- Significance; Water Potential –Definition, Water Potential Gradient. Absorption of Water; Types of Soil Water, Mechanism of Water Absorption, Active and Passive Absorption, Significance. Ascent of Sap- Transpiration Pull Theory.

UNIT II **(18 hrs)**

Minerals salt absorption; Mechanism of Mineral salt absorption Theory, Passive absorption Theory, Donnan's Equilibrium, Active absorption theory, Protein Lecithin Transpiration – Bennet Clark theory. Significance and Mechanism of Stomatal Opening and Closing – Theory of Starch, K+ Ions. Anti transpirants and Guttation.

UNIT III **(18 hrs)**

Photosynthesis - Electromagnetic Spectrum, Ground and Excited State, Structure and function of Chloroplast. Photosynthetic Apparatus. PSI and PSII Reaction Centers, Components of Cyclic and Non Cyclic Reaction. 'Z' Scheme, Emerson's Enhancement and Red Drop Effect; CO2 Assimilatory Pathway, C3, C4 cycles and CAM Pathway.

UNIT IV **(18 hrs)**

Respiration-RQ- aerobic. Structure and Funnction of Mitochandria, EMP, TCA and HMP Pathways–Significance. Anaerobic respiration. Photo respiration – Dual action of Rubisco– Glycolate (C2 pathway) Lipid metabolism –α and β oxidation. Glyoxylate metabolism – gluconeogenesis and its importance in seed germination.

UNIT V **(18 hrs)**

Phytohormones - Growth Curve, Bioassay, Chemistry and Physiological Application of Phytohormones: Auxin, Cytokinins, Gibberellins, ABA and Ethylene. Role of Light – Photoperiodism, -Types and Significance; Vernalization, Senescence and Ageing Mechanism (Brief Account). Phytochromes- Properties, Mechanism of Action and Function. Stress Physiology- Drought and Salt. Biological Clock- Circadian Rhythm in Plant (Brief Account).

TEXTBOOKS

1. Hopkins, W. G. and Huner, N. P. A. *Introduction to Plant Physiology.* 4th Edition. John Wiley and Sons, Inc. USA. 2009.
2. Srivastava, L. M. *Plant Growth and Development: Hormones and Environment.* 1st edition. Academic Press, USA. 2002.
3. Taiz, L., Zeiger, E., Moller, M. and Murphy, A. *Plant Physiology and Development.* 6th Edition. Sinauer Associates, Inc. Publishers, Massachusetts, USA. 2014.

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1. Nobel, P. S. 2009. *Physiochemical and Environmental Plant Physiology.* 4th Edition. Academic Press; 4 edition 2009.
2. Devlin and Witham. *Plant Physiology.* CBS Publishers and Distributors, New Delhi, 1997.
3. Salisbury, F.B. and Ross, C.W. *Plant Physiology.* 4th ed. Wadsworth Publishing Company, Belmont, California. 1992.

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2. https://onlinecourses.swayam2.ac.in/cec20_bt01/preview

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme – M.Sc. Botany
SEMESTER - IV
CORE COURSE - XIV: PLANT ECOLOGY (21PBYC42)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the students to ecological relationship of plants with environment and understand the various components of biodiversity threats and conservation

Course Outcomes (CO)

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

CO1[K1]: describe the concept of ecology and components of ecosystem
CO2[K2]: explain the vegetation and their relationship with the ecosystem.
CO3[K3]: determine the need for conservation and management of Biodiversity
CO4[K4]: analyze the status of plant population.
CO5[K5]: justify the RET plants conservation.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	2	-	-	-
CO2[K2]	3	2	2	2	2	1	-
CO3[K3]	3	2	1	2	-	1	1
CO4[K4]	3	2	1	2	1	1	1
CO5[K5]	3	2	3	2	1	1	2
Weightage of the course	15	10	8	10	4	4	4
Weighted percentage of Course contribution to POs	**5.68**	**4.65**	**4.12**	**6.8**	**4.3**	**4.88**	**4.3**

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

UNIT I **(18 hrs)**

Vegetation Organization, Community Concepts. Climate, Soil, Vegetative Patterns of the World, Interspecific Associations, Ordination Concept of Ecological Niche, Vegetation Development, Changes in Ecosystem Properties during Succession.

UNIT II **(18 hrs)**

Ecosystem Organization; Structure and Functions of ecosystem; Primary Production, Energy Dynamics, Global Biogeochemical Cycles of C, N, P, S and water in the Ecosystems.

UNIT III **(18 hrs)**

Ecosystem Stability & Concept; Natural and Anthropogenic perturbations, Their Impact on Plants and Ecosystem, Ecology of Plant Invasion; Environmental Impact Assessment Ecosystem, Restoration, Ecological Management, Sustainable Development.

UNIT IV **(18 hrs)**

Biological Diversity, Concept and Levels, Role of Biodiversity in Ecosystem, Functions and Stability, Speciation and Extinction, Red Data Book, IUCN RED list Categories, Biodiversity Loss- Habitat Destruction and Fragmentation, Over Exploitation of Natural Resources, Biodiversity Hot Spots.

UNIT V **(18 hrs)**

Conservation: *In Situ* Conservation - Biosphere Reserve - National Parks - Wild Life Sanctuaries- on Farm Conservation - Community Gardens, Home Gardens- *Ex Situ* Conservation, Cryopreservation, Germ-plasm Conservation, Gene Bank, Seed Bank, Pollen Bank, Tissue Culture, Community Gene Bank; Ecotourism.

TEXTBOOKS

1. Kumaresan, V. and Arumugam, N. *Plant Ecology and phytogeography*. Saras Publication, Nagercoil, 2015.
2. Erica E. Benson. *Plant Conservation Biotechnology*. Taylor and Francis group, London, 2003.
3. Begon, M. Harper, J.L. and Townssend, C.R. *Ecology*. Backwell Science, Cambridge, USA, 2014

REFERENCES

Books

1. Odum, E.P. *Fundamentals of Ecology.* Saunders, Philadelphia, 1971.
2. Muller Dombosis. Dand Ellenberg, H. *Aims and methods of vegetation Ecology*. Wiley, New York, 1974.
3. Odum, E.P. *Basic Ecology*. Saunders, Philadelphia, 1983.
4. Ludwing, J. and Reynolds, J.F. *Statistical Ecology.* John Wiley and Sons, 1988.

Web Sources

1. https://byjus.com/biology/biodiversity-conservation/#:~:text=Biodiversity%20conservation%20is%20the%20protection,conservation%20has%20three%20main%20objectives%3A&text=Sustainable%20utilization%20of%20species%20and,systems%20and%20essential%20ecological%20processes.
2. https://www.iucnredlist.org/
3. https://www.vedantu.com/biology/conservation-of-biodiversity#:~:text=Biodiversity%20conservation%20refers%20to%20the,they%20are%20healthy%20and%20functional.&text=To%20protect%20and%20preserve%20species%20diversity.
4. https://www.nationalgeographic.org/encyclopedia/ecosystem/#:~:text=Powered%20byAn%20ecosystem%20is%20a%20geographic%20area%20where%20plants%2C%20animals%2C%20and,abiotic%20factors%2C%20or%20nonliving%20parts.
5. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/ecological-niche

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG Programme - M.Sc. Botany
SEMESTER - IV
CORE COURSE - XV: PRACTICAL: PLANT PHYSIOLOGY AND PLANT ECOLOGY
(21PBYC4P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course introduces the students to study the Population analysis, Ecosystem stability and Biodiversity conservation methods.

Course Outcomes (CO)

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

CO1[K2]: illustrate the morphological, ecological and physiological adaptations of plants

CO2[K3]: calculate the plant population in an environment

CO3[K4]: analyze the Plant population through Transect and Quadrate method

CO4[K5]: assess the status of plant population

CO5[K6]: perform the monohybrid and dihybrid cross experimentally

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	2	-	-	-
CO2[K3]	3	2	2	2	2	1	-
CO3[K4]	3	2	2	2	2	1	1
CO4[K5]	3	2	2	2	2	1	1
CO5[K6]	3	2	3	2	-	1	1
Weightage of the course	15	10	11	10	06	04	3
Weighted percentage of Course contribution to POs	**5.68**	**4.65**	**5.67**	**6.8**	**6.45**	**4.88**	**3.23**

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

Experiments:

Plant Physiology

1. Determination of Osmotic potential of *Rheo* cell sap by plasmolytic method.
2. Determination of Water Potential of Potato tuber by Gravimetric method.
3. Effect of detergent on membrane permeability.
4. Effect of organic solvent (acetone) on membrane permeability.
5. Effect of temperature on membrane permeability.
6. Determination of Anthocyanin.
7. Determination of Stomatal Frequency and stomatal Index.
8. Effect of Cytokinin on the delay of senescence in terms of chlorophyll content.

Plant Ecology

1. Study of the morphological, Ecology and Physiological adaptations of locally available Hydrophytes, Xerophytes, Halophytes, Parasites and Epiphytes to correlate to their particular habitat.
2. Vegetation analysis- Transect and Quadrate method.

TEXTBOOKS

1. Kumaresan, V. and Arumugam, N. *Plant Ecology and phytogeography*. Saras Publication, Nagercoil, 2015.
2. Erica E. Benson. *Plant Conservation Biotechnology*. Taylor and Francis group, London, 2003.
3. Begon, M. Harper, J.L. and Townssend, C.R. *Ecology*. Backwell Science, Cambridge, USA.

REFERENCES

Books

1. Odum, E.P. *Fundamentals of Ecology*. Saunders, Philadelphia, 1971.
2. Muller Dombosis. Dand Ellenberg, H. *Aims and methods of vegetation Ecology*. Wiley, New York, 1974.
3. Odum, E.P. *Basic Ecology*. Saunders, Philadelphia, 1983.
4. Ludwing, J. and Reynolds, J.F. *Statistical Ecology*. John Wiley and Sons, 1988.

Web Sources

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2. https://www.youtube.com/watch?v=xTOMgXeGizU

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BOTANY
PG PROGRAMME - M.Sc. Botany
SEMESTER - IV
CORE COURSE – XVI: PROJECT (21PBYJ41)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 15 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 225 hrs **MAX. MARKS: 100**

Preamble

The Research Project aims at developing scientific research knowledge and to train the students in analyzing, interpreting the data and drawing valid conclusions. The students are allowed to choose the problems in subject areas of their own interest.

Course outcomes (CO)

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

CO1[K2]: outline the concept of research with ethics

CO2[K3]: apply academic skills to present the research study findings in a formal academic oral presentations and a written research paper

CO3[K5]: recommend valuable solutions to the betterment of society

CO4[K5]: assess ways to collect, compile and conduct a data analysis

CO5[K6]: develop laboratory skills and advanced biotechniques

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	2	1	1	1	1
CO2[K3]	3	3	3	1	1	1	1
CO3[K5]	3	3	2	1	1	1	1
CO4[K5]	3	2	3	1	1	1	1
CO5[K6]	3	2	2	1	1	1	1
Weightage of the course	15	13	12	05	05	05	05
Weighted percentage of Course contribution to POs	**5.3**	**6.05**	**6.19**	**2.72**	**5.38**	**6.1**	**5.38**

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 50 marks for Internal Assessment and 50 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 atleast three weeks prior to the end of the semester.
8. The project report should be of minimum 40-50 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 (50 Marks)

Project Report & Review	: 40 Marks
Power point Presentation	: 5 Marks
Participation/Publications in Conferences or Seminars	: 5 Marks

External Examination (50 Marks)

Project Report	: 20 Marks
Viva Voce	: 30 Marks