

**Ethiraj College for Women (Autonomous) Chennai**  
**Department of Plant Biology and Plant Biotechnology (Self Supporting)**

**M.Sc. Plant Biology and Plant Biotechnology**

**Minutes of the Board of Studies held on 29.8.2019 at 4.00 pm**

The Board of Studies meeting was conducted in the Department of Plant Biology and Plant Biotechnology on 29.8.2019 at 4.00 pm. The board members discussed about the Programme specific outcomes, course objectives and course outcomes. No changes were suggested in the Course code, Course title and Course content.

Few minor corrections has been suggested and carried out in the syllabus.

1. The question paper pattern sec A(10X2= 20 marks), sec B (5/8X 8= 40 marks), sec C (2/3X20= 40 marks) is recommended to be followed.

The members resolved to approve and ratify the syllabus of M.Sc. Plant Biology and Plant Biotechnology for the students admitted from 2018-2019 onwards.

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29/8/19

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**ETHIRAJ COLLEGE FOR WOMEN**

**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**REVISED SYLLABUS JUNE 2018**

**RULES AND REGULATIONS FOR THE PROGRAMME**

Department of Plant Biology and Plant Biotechnology is revising syllabus with effect from the academic year 2018-2019.

Every academic year is divided into two semester sessions. Each semester will have a minimum of 90 working days and each day will have 5 working hours. Teaching is organized into a modular pattern of credits courses. Credit is normally related to the number of hours a teacher teaches a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

**REGULATIONS**

**I. ELIGIBILITY FOR ADMISSION :**

Candidate for admission to the first year of the degree of Plant Biology and Plant Biotechnology courses should be required to have passed B. Sc Botany / Plant Biology and Plant Biotechnology course of study for a period of not less than three academic years, passed the examination of all six semester prescribed.

**II. ELIGIBILITY FOR THE AWARD OF DEGREE:**

A candidate shall be eligible for the award of degree only if she has undergone the prescribed course of study for a period of not less than two academic years, passed the examination of all the four semester prescribed.

**III. COURSE OF STUDY:**

The main subjects of study for the Master of Science degree shall consist of the following:

- a) Core Subjects
- b) Soft skills
- c) Elective subjects
- d) Extra disciplinary elective subjects
- e) Internship
- f) Research Project

**IV. PASSING MINIMUM**

A candidate shall be declared to have passed in each paper / practical of the main subject of study wherever prescribed, if she secured NOT LESS THAN 50% of marks prescribed for the examination.

**V. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

Successful candidate passing the examination and secured the marks (i) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND class respectively. All other successful candidates shall be declared to have passed the examination in the THIRD class. Candidate who passes all the examination prescribed for the course in the **FIRST APPEARANCE IT SELF ALONE** are eligible for the ranking.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHOICE BASED CREDIT SYSTEM**

**M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY (SELF SUPPORTING)**

**(with effect from the Academic Year 2018 - 2019 and thereafter)**

**Programme Educational Objectives**

**PEO1** Display higher order thinking in the knowledge domain and demonstrate professional skills.

**PEO2** Contribute to the advancement and application of relevant knowledge by self-directed learning.

**PEO3** Extend and integrate knowledge and skills to design and develop novel products and explore innovative solutions to national and international goals of development.

**PEO4** Exercise management skills and develop social interactions in a responsive, ethical and constructive way to meet global standards of excellence in all spheres of activity.

**PEO5** Strive for social and economic equity based on the need for gender parity and ecological sustainability.



**CHOICE BASED CREDIT SYSTEM**  
**M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY (SELF SUPPORTING)**  
**(with effect from the Academic Year 2018 - 2019 and thereafter)**

**Programme Outcomes**

- PO1** To acquire advanced conceptual knowledge and comprehensive understanding of the fundamental principles in respective discipline.
- PO2** To apply knowledge and critically evaluate the concepts and scientific developments to take up any challenge.
- PO3** To visualize and work on laboratory multidisciplinary tasks related to current research in the fields of Mathematical, Physical and Life sciences
- PO4** To acquire research based knowledge and design methods to conduct investigations of complex problems in research/ Industrial field and achieve employability / self employment.
- PO5** To communicate effectively ideas verbally in English, leading to Entrepreneurship ventures such as consultancy and training.
- PO6** Employ innovative and environment friendly methods, novel ideas to solve complex and challenging societal and environmental issues.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHOICE BASED CREDIT SYSTEM**  
**M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY (SELF SUPPORTING)**

**(with effect from the Academic Year 2018 - 2019 and thereafter)**

**Programme Specific Outcomes**

- PSO1** Apply the contextual knowledge to assess the Plant diversity, conservation, vegetative and reproductive parts of different plant forms and procure insight on concepts of Cytology and Genetics.
- PSO2** Employ innovative ideas and methods based on their practical experience and knowledge on sophisticated instruments to solve complex and challenging issues in Plant Biology, Biotechnology and allied fields.
- PSO3** Analyze data using appropriate statistical methods and think critically to design and execute an experiment with confidence.
- PSO4** Utilize the scientific skills and communicate effectively through written work, seminar and project work.
- PSO5** Stakeholders can attend and clear the competitive exams and take up promising careers in research, government and private sectors.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHOICE BASED CREDIT SYSTEM**

**M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY (SELF SUPPORTING)**

**(with effect from the Academic Year 2018-2019 and thereafter)**

## PROGRAMME PROFILE

TOTAL CREDITS – 91

SEM	COURSE CODE	TITLE OF THE PAPER	CRD	Hrs/ Wk	TOTAL HRS	CA	SE	TOTAL MARKS
I	10SP18/1C/AFV	Plantdiversity-I: Algae, Fungi, Lichens, Bryophytes, Bacteria and Viruses	4	6	90	40	60	100
I	10SP18/1C/PGP	Plantdiversity - II: Pteridophytes, Gymnosperms and Paleobotany	4	6	90	40	60	100
I	10SP18/2C/PR1	Practical - I: Covering Core Papers - I & II	-	8	120	-	-	-
I	10SP18/1E1/PPA (or) 10SP18/1E1/BPT	Plant Pathology* (or) Biopesticide technology	3	4	60	40	60	100
I	10SP18/1E2/MTE (or ) 10SP18/1E2/ALB	Microbial Technology*(or) Algal Biotechnology	3	4	60	40	60	100
I		Soft skill-Personality Enrichment for Women	2	2	30	-	50	50
II	10SP18/2C/TEB	Taxonomy and Economic Botany of Angiosperms	4	5	75	40	60	100
II	10SP18/2C/AEP	Developmental Botany - Anatomy, Embryology and Palynology of Angiosperms	4	4	60	40	60	100
II	10SP18/2C/EPE	Ecology, Phytogeography and Evolution	4	4	60	40	60	100
II	10SP18/2C/PR1	Practical - I: Covering Core Papers - I & II	4	-	-	40	60	100
II	10SP18/2C/PR2	Practical - II: Covering Core Papers III, IV and V	4	8	120	40	60	100
II	10SP18/2E3/HTE (or) 10SP18/2E3/ETB	Herbal Technology (or) Ethnobotany	3	3	45	40	60	100
II	10SP18/2E/EBO	Extra Disciplinary – I Entrepreneurial Botany (offered to other Department students)	3	4	60	40	60	100
II		Soft skill	2	2	30	-	50	50
III	10 SP19/3C/CGP	Cell Biology, Genetics and Plant Breeding	4	5	75	40	60	100
III	10SP18/3C/PMB	Plant Molecular Biology	4	4	60	40	60	100
III	10SP18/3C/PBI	Plant Biotechnology	4	4	60	40	60	100
III	10SP18/4C/PR3	Practical - III: Covering Core Papers VIII, IX and X	-	8	120	-	-	-
III	10SP18/3E4/BIS (or) 10SP18/3E4/WOT	Biostatistics (or) Wood Technology	3	3	45	40	60	100

III	10SP18/3E/MBD	Extra Disciplinary – II Medicinal Botany and Dietetics (offered to other Department students)	3	4	60	40	60	100
III	10SP18/3I/INT	Internship*	2	-	-	-	-	100
III	10SP18/3S/CBR	Soft skill III- Computing for Biological Research	2	2	30	-	50	50
IV	10SP18/4C/PPH	Plant Physiology	4	5	75	40	60	100
IV	10SP18/4C/PBB	Plant Biochemistry and Biophysics	4	6	90	40	60	100
IV	10SP18/4C/PR3	Practical - III: Covering Core Papers VI, VII and VIII	4	-	-	40	60	100
IV	10SP18/4C/PR4	Practical - IV: Covering Core Papers IX and X	4	8	120	40	60	100
IV	10SP18/4C/PRO	Research Project	4	5	75	40	60	100
IV	10SP18/4E5/BME (or) 10SP18/4E5/NBT	Bioinstrumentation and Methodology (or) Nanobiotechnology	3	4	60	40	60	100
IV	10SP18/4S/BIN	Soft skill IV-Bioinformatics	2	2	30	-	50	50

\*No practicals for elective paper

\*A minimum of fifteen days internship programme to be carried out in recognized institution during the II Semester vacation holidays

As per the guidelines a student has to study five elective papers in her curriculum.

**Total minimum credits** for the programme - 91

♦ NPTEL courses must be taken up by the students during the course.

## EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT

### INTERNAL VALUATION BY COURSE TEACHER/S

#### THEORY

2 test for 2 hours each (50 marks to be converted to 10)	20 marks
Seminar/Assignment/Quiz /Industrial visit / Field study	10 marks
Participatory learning / Group discussion	10 marks
Total	40 marks

### PRACTICALS

Paper Code	Model exam	Class work	Record	Herbarium	Field visit	Total
10SP18/2C/PR1	10	20	5	-	5	40
10SP18/2C/PR2	10	15	5	5	5	40
10SP18/4C/PR3	10	25	5	-		40
10SP18/4C/PR4	10	25	5	-	-	40

### PROJECTS

Paper Code	Lab work	Presentation	Total
10SP18/2C/PRJ	20	20	40

### CA QUESTION PAPER PATTERN

Knowledge Level	Section	Word Limit	Marks	Total
K3	A-5X2 marks	50	10	50
K 3	B-4/6X5 marks	250	20	
K4, K 5	C-1/2X20 marks	1500	20	

### RUBRICS FOR CONTINUOUS ASSESSMENT (THEORY)

**Seminar** -Organization/ subject knowledge/ visual aids/ confidence level/ presentation- Communication and Language

**Assignment** -Contents/originality/presentation/schematic representation and diagram/Bibliography

**Industrial visit /  
Field study** -Participation /Attitude/Conduct

**Participatory learning /**

**Group discussion**

-Answering question/ Clearing doubts/ participation in discussion/attendance/communication and language

**END SEMESTER EVALUATION PATTERN**

**THEORY PAPERS**

**SEMESTER I/II/III/IV**

**DOUBLE VALUATION BY COURSE TEACHER AND EXTERNAL EXAMINER**

**MAXIMUM MARKS: 100 TO BE CONVERTED TO 60**

**PASSING MARKS: 50**

**PRACTICAL PAPERS**

**SEMESTER I&II/III&IV**

**DOUBLE VALUATION BY COURSE TEACHER AND EXTERNAL EXAMINER**

**MAXIMUM MARKS: 100 TO BE CONVERTED TO 60**

**PASSING MARKS: 50**

**SOFT SKILLS PAPERS**

**SEMESTER I/II/III/IV**

**SINGLE VALUATION BY COURSE TEACHER**

**MAXIMUM MARKS: 50**

**PASSING MARKS:**

**PROJECT PAPER**

**SEMESTER IV**

**DOUBLE VALUATION BY RESEARCH SUPERVISOR AND EXTERNAL EXAMINER**

**DISSERTATION: 40**

**VIVA: 20**

**MAXIMUM MARKS: 60**

**PASSING MARKS: 30**

**INTERNSHIP**

**YEAR I**

**SEMESTER II**

**COURSE PROFILE**

**I YEAR - FIRST SEMESTER**

**TOTAL CREDITS -16**

<b>COURSE CODE</b>	<b>TITLE OF THE PAPER</b>	<b>CREDITS</b>	<b>HRS/ WK</b>	<b>TOTAL HOURS</b>	<b>L-T-P</b>	<b>CA</b>	<b>SE</b>	<b>TOTAL</b>
10SP18/1C/AFV	CorePaper-I Plantdiversity-I:Algae, Fungi,Lichens, Bryophytes, Bacteria and Viruses	4	6	90	3-3-0	40	60	100
10SP18/1C/PGP	CorePaper-II Plantdiversity - II: Pteridophytes, Gymnosperms and Paleobotany	4	6	90	3-3-0	40	60	100

10SP18/2C/PR1	Practical – I**: Covering Core Papers - I & II	-	8	120	0-0-8	-	-	-
10SP18/1E1/PPA (or) 10SP18/1E1/BPT	Elective-I Plant Pathology * (or) Biopesticide Technology	3	4	60	2-2-0	40	60	100
10SP18/1E2/MTE (or) 10SP18/1E2/ALB	Elective-II Microbial Technology* (or) Algal Biotechnology	3	4	60	2-2-0	40	60	100
-	Soft skill-I Personality Enrichment for Women	2	2	30		-	50	50

**\*No practicals for elective paper**

**\*\* Core practical will be conducted at the end of the year.**

THE ABOVE COURSES OF THE PG PROGRAM ENRICH THE SKILLS IN EMPLOYABILITY / SKILL DEVELOPMENT / ENTREPRENEURSHIP WHICH CATER TO THE NEEDS OF THE STUDENTS.

## SEMESTER-I

### CORE PAPER- I PLANT DIVERSITY –I

#### ALGAE, FUNGI, LICHENS, BRYOPHYTES, BACTERIA AND VIRUSES

COURSE CODE-10SP18/1C/AFV

Teaching hours: 6/ Week

Credits: 4

90/ Semester

L-T- P

3 -3- 0

#### COURSE OBJECTIVES:

To enable the students to

1. Understand the diversity among Algae, morphology, structure, lifecycle and economic importance.
2. Impart knowledge on morphology, structure, lifecycle and economic importance of Fungi
3. Study the morphology, structure, lifecycle and economic importance of Bryophytes.
4. Acquire knowledge on the structure, reproduction and economic importance of Lichens.
5. Learn the classification, structure, reproduction, life cycles, economic importance and harmful effects of Bacteria, Mycoplasma, Viruses and Viroids



## COURSE OUTLINE:

### UNIT - I: Algae

(20Hrs)

History of Algology, Classification of algae by Fritsch (1935-45) and Christensen (1964) system. General characteristic features of algae: Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenophyceae, Phaeophyceae, Rhodophyceae, and Cyanophyceae. Structure, reproduction and life histories of the following genera: *Anabaena*, *Scytonema*, *Ulva*, *Codium*, *Cyclotella*, *Padina*, *Gelidium*.

### UNIT - II: Fungi

(20Hrs)

History of Mycology, Classification of Fungi Alexopoulos and Mims (1979). Heterothallism in fungi, sexuality in fungi, Parasexuality, sex hormones in fungi. Cultivation of mushrooms – *Pleurotus*, Mycorrhizal Fungi, Economic importance of fungi.

Structure, reproduction and life histories of the following genera:

Plasmiodiophomycetes	: <i>Plasmodiophora</i>
Oomycetes	: <i>Phytophthora</i>
Zygomycetes	: <i>Rhizopus</i>
Ascomycetes	: <i>Taphrina</i>
Basidiomycetes	: <i>Polyporus</i>
Deuteromycetes	: <i>Fusarium</i> , <i>Alternaria</i> , <i>Colletotrichum</i>

### UNIT - III: Lichens

(15Hrs)

Lichens: Classification - Structure of thallus, nutrition, asexual reproduction, sexual reproduction, structure of apothecium, economic importance.

### UNIT - IV: Bryophytes

(20Hrs)

Classification of Bryophytes by Watson (1971). General characteristic features of Bryophytes: Hepaticopsida, Anthocerotopsida and Bryopsida. Range of gametophytes and sporophytes in bryophytes. Economic importance of bryophytes. Structure, reproduction and life histories of the following genera: *Reboulia*, *Anthoceros*, *Porella*, *Funaria*.

### UNIT - V: Bacteria and Viruses

(15Hrs)

Classification, structure and reproduction of Bacteria, Mycoplasma, Viruses - Harmful and beneficial microbes. Important plant diseases caused by bacteria, viruses and viroids.

## RECOMMENDED TEXTBOOKS

1. Kumar. H. D. and H. N. Singh. A text book of Algae. Affiliated Esat West Press. Pvt. Ltd. New Delhi (1979)C.J. Alexopoulos, Introductory Mycology (First Edition)
2. C.J. Alexopoulos, C.W. Mims,M. Blackwell. Introductory Mycology (Fourth Edition) Wiley India Pvt. Ltd (2007).
3. Gangulee and Khar. College Botany The New Central Book Agency Calcutta, 6<sup>th</sup> edition (2011)

4. Fritsch, F. E.1967. The Structure and Reproduction of Algae, Vol.I I. University Press Cambridge
5. Fritsch, F. E.1967. The Structure and Reproduction of Algae, Vol II. I. University Press Cambridge
6. Dubey & D K Maheshwari, A Textbook of Microbiology, 3<sup>rd</sup> edition,2013.

#### REFERENCE BOOKS

1. Chapman,V. J. 1962. The Algae. Macmillan and Co. Ltd. New York.
2. Smith, G. M.1955. Cryptogamic Botany Vol. IMc Graw – Hill Co.New York
3. Smith, S and Reed, D. J.1997. Mycorrhizal Symbiosis Academic Press.
4. Stein, J. R. 1980. Hand Book of Phycological Methods. University Press. Cambridge
5. Elizabeth Moore and Landecker Fundamentals of Fungi. Benjamin-Cummings Publishing Company (1996).
6. Vashista, Sinha B.R., Singh, V.P., 2013, Botany for Degree students, Algae 9<sup>th</sup> revised edition, S. Chand & Company Ltd., New Delhi.

#### JOURNALS

1. American Journal of Botany (AJB)
2. Indian journal of experimental biology

#### E-LEARNING RESOURCE

1. [https://www.livescience.com/amp/54979-what-are-algae.html#aoh=15669283508959&\\_ct=1566928356695&referrer=https%3A%2F%2Fwww.google.com&\\_tf=From%20%251%24s](https://www.livescience.com/amp/54979-what-are-algae.html#aoh=15669283508959&_ct=1566928356695&referrer=https%3A%2F%2Fwww.google.com&_tf=From%20%251%24s)
2. <https://ucmp.berkeley.edu/fungi/fungi.html>
3. <https://www.anbg.gov.au/lichen/what-is-lichen.html>
4. <https://www.toppr.com/guides/biology/plant-kingdom/bryophytes/>
5. <https://science.jrank.org/pages/714/Bacteria.html>

#### COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Discuss the classification, structure, reproduction, life cycles and economic importance of Algae	K2, K4
CO 2	Outline the classification, structure, reproduction, life cycles and economic importance of Fungi	K3, K4
CO 3	Explain the structure, reproduction and economic importance of Lichens	K2, K3
CO 4	Analyse the classification, structure, reproduction, life cycles and economic importance of Bryophytes.	K2, K3
CO 5	Compile the classification, structure, reproduction, life cycles, economic importance and harmful effects of Bacteria, Mycoplasma, Viruses and Viroids	K3, K4

#### MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	3
CO 2	3	2	2	3	3
CO 3	3	2	2	3	3
CO 4	3	2	2	3	3
CO 5	3	2	2	3	3
Average	3	2	2	3	3

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning,  
Field Visits.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER- I PLANT DIVERSITY –I**

**ALGAE, FUNGI, LICHENS, BRYOPHYTES, BACTERIA AND VIRUSES**

**COURSE CODE-10SP18/1C/AFV**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

## CORE PAPER- II

### PLANT DIVERSITY- II PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Teaching hours: 6 / Week  
90/Semester

COURSE CODE-10SP18/1C/PGP  
Credits: 4  
L-T- P  
3 -3- 0

#### COURSE OBJECTIVES:

To enable the students to

1. Learn the general characters and classification of Pteridophytes and Gymnosperms
2. Understand the diversity, structural organization and reproduction of Pteridophytes and Gymnosperms
3. Discuss the life history of Pteridophytes and Gymnosperms
4. Make the students aware of the economic value of Pteridophytes and Gymnosperms
5. Summarize the importance of fossils

#### COURSE OUTLINE:

##### UNIT - I: Pteridophytes (15Hrs)

General characteristics and classification (Reimer, 1954). Apospory - Apogamy, Origin and evolution of stele and soral evolution. Heterospory and seed habit, Telome theory, morphogenesis, Economic importance.

##### UNIT - II (20Hrs)

Structure, reproduction and life cycle of the following genera: *Isoetes*, *Angiopteris*, *Osmunda*, *Pteris*, *Polypodium*, *Salvinia*

##### UNIT - III: Gymnosperms (15Hrs)

General characters - Range of structure, Anatomy, Reproduction, Phylogeny and Classification (K.R.Sporne, 1965). Phylogeny and Economic importance of Gymnosperms.

#### UNIT - IV

(20Hrs)

Structure, reproduction and life cycle of the following genera: *Araucaria*, *Podocarpus*, *Cupressus*, *Ephedra*.

#### UNIT - V: Paleobotany

(20Hrs)

Study of fossils - Importance of Fossils: Formation and types of fossils, techniques of study of fossils, geological time scale. Applied aspects of paleobotany; use in coal and petroleum exploration. Study of organ genera: *Calamites*, *Sphenophyllum*, *Calamostachys*. Study of organ genera: *Lyginopteris*, *Medullosa*, *Pentoxylon*.

#### RECOMMENDED TEXT BOOKS

1. Pandey B.P., 2006 – A text book of Botany, Pteridophytes and Gymnosperms, Vol.II, S.Chand & Co
2. Parihar N.S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
3. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperm New Age International pvt. Ltd., NewDelhi.
4. Stewart, W.N and Rathwell, G.W.1993. Paleobotany and the evolution of plants, Cambridge University press.
5. Vashista. P.C. 2010, Gymnosperms, S.Chand & Co.
6. Vashista.P.C., 2010 – Botany for Degree students : Pteridophyta. S.Chand & Co.

#### REFERENCE BOOKS

1. Eames.A, 1963 – Morphology of lower vascular plant, McGraw Hill.
2. Forster and Gifford, 1959 – Comparative Morphology of a Vascular Plants.
3. Smith.G.M. 1955- Crytogamic Botany, Volume-III – McGraw Hill.
4. Sporne.K.R., 1991– The Morphology of Pteridophytes, , B.I.Publishing pvt. Ltd
5. Sharma.O.P.,2012- Pteridophyta , Tata McGraw-Hill Education private limited.
6. Chainberlain.C.J. – Gymnosperms structure and evolution, Chicago,1935
7. Sporne. K.R., - Morphology of Gymnosperms, Hutchinson University Library,1965.
8. Singh.V., Pandey.P.C., and Jain.D.K.2018. A Textbook of Botany. Rastogi Publications

#### JOURNALS

1. Journal of Plant Research
2. Phytotaxa

#### E-LEARNING RESOURCES

1. <http://www.biologydiscussion.com/articles/pteridophytes-features-economic-importance-and-classification/5698>
2. <http://www.academia.edu-stelar> system
3. <https://www.askiitians.com/biology/plant-kingdom/pteridophytes.html>

4. <https://www.plantscience4u.com/2014/05/economic-importance-of-gymnosperms.html>

5. [https://www.newworldencyclopedia.org/entry/Geologic\\_time\\_scale](https://www.newworldencyclopedia.org/entry/Geologic_time_scale)

### **COURSE OUTCOMES**

<b>CO No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	List the general characters and economic importance of Pteridophytes	K3, K4
<b>CO 2</b>	Compare the structure and reproduction of various Pteridophytes	K4
<b>CO 3</b>	Outline the general characters and economic importance of Gymnosperms	K3, K4
<b>CO 4</b>	Analyse the lifecycle patterns of different Gymnosperms	K4
<b>CO 5</b>	Discuss the applied aspects of Paleobotany	K3, K4

### **MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>

### **TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning,  
Field Visits.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER- II**

**PLANT DIVERSITY- II PTERIDOPHYTES, GYMNOSPERMS AND  
PALEOBOTANY**

**COURSE CODE-10SP18/1C/PGP**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		



### CORE PAPER-III

#### PRACTICAL-I : COVERING THEORY PAPERS I AND II

	COURSE	CODE-
10SP18/2C/PR1		
Teaching hours : 8/ Week	Credits: 4	
120/ Semester	L-T- P	
	0- 0 - 8	

#### COURSE OBJECTIVES:

To enable the student to

1. Study different forms of Algae.
2. Learn techniques to identify different Fungi.
3. Observe the morphological and anatomical details of Bryophytes.
4. Understand the vegetative and reproductive structures of Pteridophytes and Gymnosperms.
5. Study various fossil forms.

#### COURSE OUTLINE:

##### Algae

Study of algae in the field and laboratory of the genera included in theory. External morphology and internal anatomy of the vegetative and reproductive structures of genera given in the theory. Preparation of culture media and Culture of Green Algae and Blue Green Algae in the Laboratory (Demonstration). Haemocytometer, TDS meter.

##### Fungi

Study of morphological and reproductive structures of the genera mentioned in theory. Isolation and identification of fungi from soil, air, and Baiting method. Preparation of culture media.

##### Lichens

Study of morphological and reproductive structures of the genera *Usnea*.

##### Bryophytes

External morphology and internal anatomy of the vegetative and reproductive organs of genera given in the theory.

##### Bacteria and Viruses

Diseases caused by Bacteria and Viruses in plants, Gram's Staining.



### **Pteridophytes, Gymnosperms and Paleobotany**

External morphology and internal anatomy of the vegetative and reproductive organs of genera given in the theory.

**Bonafide record of practical work done should be submitted for the practical examination.**

### **COURSE OUTCOMES**

<b>CO No.</b>	<b>CO Statement</b>
<b>CO 1</b>	Evaluate different algal forms
<b>CO 2</b>	Analyse different forms of fungi
<b>CO 3</b>	Discuss structural organization of various bryophytes
<b>CO 4</b>	Compare vegetative and reproductive structures of pteridophytes and gymnosperms
<b>CO 5</b>	Identify different fossil forms

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**  
**M. Sc. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**  
**PRACTICAL EXAMINATION**

<b>TITLE OF THE PAPER: PRACTICAL – I</b>	<b>Max Marks- 100</b>
<b>PAPER CODE: 10SP18/2C/PR1</b>	<b>Practical - 85</b>
	<b>Record - 10</b>
	<b>Viva-voce - 5</b>
	<b>Time- 4 hrs</b>

1. Cut transverse sections of **A, B** and **C**. Give reasons for your identification. **Submit the slides** for valuation. (3X6 = 18 marks)
2. Cut transverse sections of **D** and **E**. Draw labeled sketches. Identify giving reasons. **Submit the slides** for valuation. (2 X 6 =12 marks)
3. Prepare suitable micro-preparations of **F**. Draw labeled sketches. Identify giving reasons. **Submit the preparation** for valuation. (6 marks)
4. Name any two organisms in the given mixture **G**. Draw diagrams, identify giving reasons. (6 marks)
5. Write the protocol **H** for the isolation of fungi from soil / air. (3 marks)
6. Write critical notes on **I, J, K, L, M, N, O & P**. (8 X 4 = 32 marks)
7. Comment on the structure of **Q** and **R**. Mention the geological era and draw the diagram. (2 X 4 = 8 marks)

## ELECTIVE-I: PLANT PATHOLOGY

Teaching hours: 4/ Week  
60/Semester

COURSE CODE-10SP18/1E1/PPA  
Credits: 3  
L-T- P  
2-2- 0

### COUESE OBJECTIVES:

To enable the student to

1. Understand concepts and principles of plant pathology.
2. Be aware of the pathogenesis of the host plants.
3. Impart knowledge about symptomatology, disease cycle and control measures of certain plant diseases.
4. Be familiar of the genetics of plant diseases.
5. Expose to modern tools in disease diagnosis.

### COURSE OUTLINE:

#### UNIT- I

(10Hrs)

History and Principles of Plant Pathology, Scope and Significance of Plant pathology Plant Pathogens – Variation in Plant pathogens – Epidemiology and forecasting of Plant diseases – Host Pathogen Interaction.

#### UNIT- II

(15Hrs)

Pathogenesis or Disease development, Environment and nutrition in relation to disease development – Plant Defence mechanism – Molecular tools for diagnosis of disease in relation to Plant Pathology.

#### UNIT- III

(15Hrs)

Principles of Plant diseases, Important diseases of crop plants in India (Sheath blight of Rice, Wilt of Tomato, Late blight of Potato, Smut of Sugar cane, Yellow Mosaic Virus in Bhindi). Mycoplasma (Little leaf diseases) – A brief account on Nematodes and Phytoplasma – Abiotic diseases. Plant disease control (physical, chemical and biological), Integrated disease management.

#### UNIT- IV

(10Hrs)

Genetics of plant disease: Disease Resistance – Genetics of virulence and resistance, Gene-for-gene concept, Techniques in plant breeding for disease resistance. Genetics of Host – parasite interaction – mutation, heterokaryosis, parasexual recombination.

## UNIT- V

(10Hrs)

Molecular Plant Pathology: Detection of pathogens in host tissues – ELISA, Incorporation of resistant gene Methods- Electroporation and *Agrobacterium* mediated transformation.

### RECOMMENDED TEXTBOOKS

1. Pathak, Khatri and Pathak. 1996. Fundamentals of Plant Pathology. AgroBios, Jodhpur.
2. Pandey, B.P. 1982. Plant Pathology – Pathogen and Plant disease. S.Chand & Company Pvt. Ltd, New Delhi.
3. Rangaswami G and A. Mahadevan Diseases of Crop plants in India. IV Edition Practice Hall 1999.
4. Bilgrami K.S. and Dube H.C., A Text Book of Modern Pathology Vikas publishing house pvt., Ltd., 1976.
5. Mehrotra R.S. Plant Pathology Tata-Mc Graw Hill Publish, co., Ltd., 1980.

### REFERENCE BOOKS

1. Agrios, G.N. Plant pathology, Elsevier 2008.
2. Chatterjee P.B., Plant protection techniques Bharati Bhavan 1997
3. Das Gupta H.K. Principles of Plant pathology Allied Publishers 1988.
4. Singh R.S. Plant Pathogens : The fungi Oxford & IBH Publisher Co.1982.
5. Singh R.S. Plant Diseases Oxford and IBH publishing co., 1983.
6. Walker J.C. Plant Pathology Tata Mc Graw Hill Publishers 1969.
7. Mishra, A., A. Bohra and A. Mishra. 2011. Plant Pathology-Disease and Management. AgroBios, Jodhpur.

### JOURNALS

1. Journal of Plant Pathology & Microbiology
2. Asian journal of plant pathology

### E-LEARNING RESOURCES

1. [http://oar.icrisat.org/3918/1/12\\_Integrated\\_Pest\\_Management\\_Options.pdf](http://oar.icrisat.org/3918/1/12_Integrated_Pest_Management_Options.pdf)
2. <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/host-pathogen-interaction>
3. [https://www.researchgate.net/publication/308642520\\_Molecular\\_Plant\\_Pathology](https://www.researchgate.net/publication/308642520_Molecular_Plant_Pathology)
4. <http://www.hillagric.ac.in/edu/coa/ppath/lect/plpath111/Lect.%201%20%20Introduction-Pl%20Path%20111.pdf>
5. <http://www.hillagric.ac.in/edu/coa/ppath/lect/plpath233/PlPath233-I-DISEASES-OF-FIELD-CROPS-AND-THEIR-MANAGEMENT.pdf>

**Note: No Practical for this paper.**

**COURSE OUTCOMES**

<b>CO No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Analyse the significance of plant pathology and the interaction between host and pathogen	K4
<b>CO 2</b>	Discuss about the defence mechanism of the host plants	K3, K4
<b>CO 3</b>	Design certain control measures including integrated pest management	K3,K4
<b>CO 4</b>	Explain genetical factors behind plant diseases and the resistance against pathogens	K3, K4
<b>CO 5</b>	Select tools which detect plant diseases at molecular level	K4, K5

**MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME**

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>1.8</b>	<b>2.4</b>	<b>1.4</b>	<b>3</b>	<b>3</b>

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning,  
Field Visits.

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**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE-I: PLANT PATHOLOGY**

**COURSE CODE-10SP18/1E1/PPA**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**ELECTIVE-I: BIOPESTICIDE TECHNOLOGY**

**Teaching hours: 4/ Week  
60/Semester**

**COURSE CODE-10SP18/1E1/BPT  
Credits: 3  
L-T- P  
2-2- 0**

**COURSE OBJECTIVES:**

To enable the students to

1. Gain knowledge on biopesticides.
2. Know the different types of biopesticides.
3. Study the importance of biopesticides.
4. Evaluate target pest and crops of important biopesticides.
5. Understand the commercialization and efficiency of biopesticides.

### **COURSE OUTLINE:**

#### **UNIT- I (10Hrs)**

Introduction of biopesticides. Advantages for the use of biopesticides.

#### **UNIT- II (10Hrs)**

Types of biopesticides: Bioinsecticides, biofungicides, biobactericides, bionematicides and bioherbicides.

#### **UNIT- III (15Hrs)**

Important bioinsecticides: *Bacillus thuringiensis*, NPV, entomopathogenic fungi (*Beauveria*, *Metarhizium*, *Verticillium*, *Paecilomyces*, *Momuraea*). Biofungicides: *Trichoderma*, *Gliocladium*, *Coniothyrium*, non-pathogenic *Fusarium*, *Pseudomonas* spp., *Bacillus* spp. Biobactericides: *Agrobacterium radiobacter*, *Pseudomonas* spp., *Bacillus* spp. Bionematicides: *Paecilomyces*, *Trichoderma*, Bioherbicides: *Phytophthora*, *Colletotrichum*.

#### **UNIT- IV (10Hrs)**

Target pests and crops of important biopesticides and their mechanisms of action.

#### **UNIT- V (15Hrs)**

Mass multiplication and formulation technology of biopesticides. Prospects and problems in commercialization and efficiency of biopesticides. Commercial products of biopesticides.

### **RECOMMENDED TEXTBOOKS**

1. Dube H.C. (2013). An Introduction To Fungi - Scientific Publishers
2. Mehrotra R.S and Aneja R.S (1998). An introduction to Mycology. New Age Intermediate Press.
3. Mehrotra, B.S. 1976. The Fungi. Oxford and IBH Publishing Co., New Delhi.

### **REFERENCE BOOKS**

1. Ainsworth, G.C. 1971. A Dictionary of the Fungi. Commonwealth Mycological Institute, Kew, Surrey, England.
2. Alexopoulos C.J , Mims C.W. and Blackwell M.I 1996. Introductory Mycology. 4<sup>th</sup> Edition. John Wiley and Sons Inc.
3. Bessey (1950). Morphology and Taxonomy of fungi. The Blakistan Co.

4. Burnett J.H. (1968). Fundamentals of Mycology. Edwards Arnold Publication, Cambridge, UK. 841p.
5. Carlile, M.J., Watkinson, S.C., and Gooday, G.W. 2001. The Fungi. 2nd Edition. Academic Press, San Diego
6. Carlile, M.J., Watkinson, S.C. and Gooday, G.W. 2005. The Fungi. Elsevier, New Delhi.
7. Gilman, J.C. 1957. A manual of soil fungi. Iowa State College Press, Ames, Iowa.
8. Hawksworth, D.L., Kirk, P.M., Sutton, B.C., and Pegler, D.N. 1995. Ainsworth & Bisby's Dictionary of the Fungi. 8th Edition. C.A.B. International.
9. Kendrick, B. 2000. The Fifth Kingdom. 3<sup>rd</sup> edition. Focus Publishing, Newburyport, MA. 386 p.
10. Moore-Landecker, E. 1996. Fundamentals of the fungi, Prentice Hall international, USA.
11. Subramanian, C.V. 1983. Hyphomycetes: Taxonomy and Biology. Academic Press, London and New York.
12. Talbot, P.H.B. 1971 Principles of Fungal Taxonomy. Macmillan Press, London.
13. Webster, J. 1970. Introduction to Fungi. Cambridge University Press, UK.
14. Webster, J. and Weber, R. 2007. Introduction to Fungi. 3rd Edition. Cambridge University Press, UK.

**Note: No Practical for this paper.**

#### **COURSE OUTCOMES**

<b>CO No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Outline the use of biopesticides.	K4
<b>CO 2</b>	Discuss about the different types of biopesticides	K3, K4
<b>CO 3</b>	Analyze the role of important biopesticides	K3, K4
<b>CO 4</b>	Explain the mechanism of action of biopesticides	K3, K4
<b>CO 5</b>	Formulate the commercial products of biopesticides.	K4, K5

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**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE-I: BIOPESTICIDE TECHNOLOGY**

**COURSE CODE-10SP18/1E1/BPT**

**QUESTION PAPER PATTERN**



Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

### **ELECTIVE-II: MICROBIAL TECHNOLOGY**

Teaching hours: 4/ Week  
60/Semester

**COURSE CODE-**  
**10SP18/1E2/MTE**  
**Credits : 3**  
**L-T- P**  
**2-2- 0**

#### **COURSE OBJECTIVES:**

To enable the students to

1. Understand the bioreactors, product formation and applications of fermentation.
2. To create awareness regarding the role of microbes in industry and its products.
3. To impart knowledge on the various habitats and its applications.
4. Enable to study the role of microbes in food industry.
3. Acquaint knowledge on the basics of immunology and its interactions.

## **COURSE OUTLINE:**

### **UNIT - I: Industrial Microbiology (10Hrs)**

**Industrial fermentation** - Type of bioreactors - Inoculum development - Scaling up process from shake flask to industrial fermentation - Recovery and purification of intracellular and extracellular products.

### **UNIT - II (10Hrs)**

**Microbial production of antibiotics** - Penicillin, Streptomycin- Organic acid- lactic acid , Citric acid, Vitamin - B 12 - Amino acid - Lysine - Enzyme - amylase & production of pharmaceutical compounds through microbes.

### **UNIT - III: Environmental and Agricultural Microbiology (10Hrs)**

Microbes in terrestrial, aquatic, microbes in the extreme environments and their adaptations; methods for the determination of microbial numbers, biomass and activities. Significance of microbial activities in the environment Microbial degradation of pesticides, petroleum and hydrocarbons; Microbial inoculants in agricultural; microbes as biological control agents.

### **UNIT - IV: Food Microbiology (15Hrs)**

Brief history of microorganism in food stuffs; source, **types and role of microorganisms in spoilage of fruits and vegetables** - fresh and processed meats and poultry, miscellaneous foods such as eggs, bakery products, dairy products, beer, wines, and canned foods. Food safety regulations.

### **UNIT - V: Immunology and its application (15Hrs)**

Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules. **Generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions.**

## **RECOMMENDED TEXT BOOKS**

1. Wulf Cruger and Anneliese Crueger, Biotechnology: A Textbook of Industrial Microbiology, 2<sup>nd</sup> edition, Panima Publishing Corporation, 2004.
2. Casida Jr, L.E., Industrial Microbiology, 1st edition, New Age International (P) Ltd, 2007.
3. Kuby R.A. Goldsby et al., 2002. Osborne Immunology (Ed: 6) Freeman & Co., New York.
4. Stanbury P.F. et al. 3<sup>rd</sup> edition. 2016. Principles of Fermentation Technology, Butterworth-Heinemann, UK.

5. K. Suresh, P K Sivakumar & M.M. Joe, An Introduction to Industrial Microbiology, 2010.
6. Tizard, Ian R. Immunology and introduction, Fourth Ed, Saunders college publishing, New Delhi, 2010 Coico R, Sunshine G. Immunology: A short course, Sixth Edition, Wiley-Blackwell publishers, Canada 2009.
- 7.

## REFERENCE BOOKS

1. Young M.M. and Reed. 2004. Comprehensive Biotechnology: The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine. Vol 1, 2, 3 and 4. Elsevier India Private Ltd, India.
2. Johnson-Green, Perry, "Introduction to Food Biotechnology", 2018.
3. G. Tortora, B. Funke and C. Case. Microbiology: An Introduction. 12th ed. Menlo Park, CA: Benjamin/Cummings, 2015
4. J. Ingraham and C. Ingraham. Introduction to Microbiology. Belmont, CA: Wadsworth, 9<sup>th</sup> edition, 2000.
5. T.D. Brock, M.T. Madison, J. M. Martinko and J. Parker. Biology of Microorganisms. 15<sup>th</sup> ed. Englewood Cliffs, N.J: Prentice-Hall, 2019.

## JOURNAL

1. Journal of Food and Bioprocess Technology
2. Journal of Bioprocessing & Biotechniques
3. Journal of Immunology

## E – LEARNING RESOURCES

1. [https://books.google.co.in/books?id=yYOoBQAAQBAJ&printsec=frontcover&dq=fermentation+technology&hl=en&sa=X&ved=0ahUKBwiki8jD4p\\_kAhVLP48KHR1ZC0gQ6AEIVjAH#v=onepage&q=fermentation%20technology&f=false](https://books.google.co.in/books?id=yYOoBQAAQBAJ&printsec=frontcover&dq=fermentation+technology&hl=en&sa=X&ved=0ahUKBwiki8jD4p_kAhVLP48KHR1ZC0gQ6AEIVjAH#v=onepage&q=fermentation%20technology&f=false)
2. <https://bioprocessing.weebly.com/bioprocess-technology.html>
3. <https://www.sciencedirect.com/topics/social-sciences/food-technology>
4. <https://www.sciencedirect.com/book/9780122740206/immunology>
5. <https://www.nap.edu/read/2052/chapter/6>

**Note: No Practical for this paper.**

## COURSE OUTCOMES

CO.No.	CO Statement	Knowledge Level
CO 1	Design the basic knowledge about the industrial techniques and process involved.	K4,K5
CO 2	Formulate the industrial production of various products using microbes.	K4

<b>CO 3</b>	Explain the microbial habitats and its applications in the various fields.	K3,K4
<b>CO 4</b>	Utilize the role of microbes in the field of food industry and its regulations.	K4
<b>CO 5</b>	Discuss the basics of immunology and its importance.	K3,K4

**MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME**

<b>CO / PO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	1	2	2	3	3
<b>CO 2</b>	1	3	3	3	3
<b>CO 3</b>	1	2	2	3	3
<b>CO 4</b>	1	2	2	3	3
<b>CO 5</b>	1	2	2	3	3
<b>Average</b>	1	2.2	2.2	3	3

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
 E Content, Videos/ Animation,  
 Quiz-Seminar,  
 Peer Learning.

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**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE-II: MICROBIAL TECHNOLOGY**

**COURSE CODE-10SP18/1E2/MTE**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		

<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		
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## **ELECTIVE-II: ALGAL BIOTECHNOLOGY**

**Teaching hours: 4/ Week**  
**60/Semester**

**COURSE CODE-**  
**10SP18/1E2/ALB**  
**Credits : 3**  
**L-T- P**  
**2-2- 0**

### **COURSE OBJECTIVES:**

To enable the student to

1. Gain knowledge on Algal cultivation methods.
2. Discuss on industrial and agricultural applications of Algae.
3. Assess the therapeutic use of Algae.
4. Perceive knowledge on Algal Biotechnology.
5. Discuss the role of Algae in Environmental health.

### **COURSE OUTLINE:**

#### **UNIT – I**

**(10Hrs)**

Objectives of algal biotechnology, Resource potential of algae. Commercial utility of algae, Algal production systems; indoor cultivation methods and Large-scale cultivation of algae. Harvesting algae.

#### **UNIT – II**

**(15Hrs)**

**Industrial application** of algal fuel, algal lipids- transesterification to ester fuel- substitutes for petroleum derived fuel, production of fine chemicals, biofertilizers and hormones, application of seaweed liquid fertilizers. Algae as food for fish, poultry and animals.

### UNIT – III

(10Hrs)

**Therapeutic uses.** Remedial compounds, antioxidant, antithrombotic, anticoagulants, wound healing, skin diseases, antiulcerogenic, antifungal, antibiotics and antitumour, antiviral compounds. Production of pigments and utilization. Role of algae in agriculture and aquaculture. symbiotic algae.

### UNIT – IV

(15Hrs)

**Immobilization of algae:** natural compounds of immobilization, methods of immobilization, Recombinant DNA technology in algae. Isolation, fusion and regeneration of protoplasts in macroalgae.

### UNIT – V

(10Hrs)

**Role of algae in environmental health;** Phycoremediation, Sewage disposal and waste treatment of industrial effluent, algae as indicators in assessing water quality and pollution. Role of algae in nanobiotechnology.

#### RECOMMENDED TEXTBOOKS

1. Kumar H. D and H. N. Singh.1982. A text Book on Algae. Affiliated East- West Press Pvt. Ltd
2. Morris, I. 1968. An Introduction to the Algae, Hutchinson University Library, London
3. Smith, G. M.1955. Cryptogamic Botany Vol. IMc Graw – Hill Co. New York
4. Smith, S and Reed, D. J.1997. Mycorrhizal mSymbiosis Academic Press.

#### REFERENCE BOOKS

1. Baddiley, S. Carey, N.H. Higgins, I.J. and Potter , W.G. 1994 .Microalgae: Biotechnology and Microbiology. Cambride University Press..Cambridge.
2. Becker. E.W. 1994. Micro algae Biotechnology and Microbiology.Cambridge University press.
3. Borowitzka, M.A. and borowizka, L.J. Microalgal Biotechnology. Ignacimuthu, S. 1996. Basic Biotechnology. Tata Mc Graw Hill Publishing Ltd. New Delhi.
4. Trehan, K. 1990. Biotechnology. Narois Pub. House. London.
5. Trivedi, P.C. 2001. Algal Biotechnology.. Point publisher, Jaipur.India.
6. Alexopoulos, C. J. And Bold, H. C. Algae and Fungi. The Macmillion Co. London

#### COURSE OUTCOMES:

CO.No.	CO Statement
CO 1	Apply various methods of algal production

<b>CO 2</b>	Evaluate industrial and agricultural applications of algae
<b>CO 3</b>	Assess the therapeutic use of algae
<b>CO 4</b>	Demonstrate r DNA technology in algae
<b>CO 5</b>	Discuss the role of algae in environmental health

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
 E Content, Videos/ Animation,  
 Quiz-Seminar,  
 Peer Learning.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY  
 ELECTIVE-II: ALGAL BIOTECHNOLOGY  
 COURSE CODE-10SP18/1E2/ALB**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**COURSE PROFILE**  
**I YEAR - SECOND SEMESTER**  
**TOTAL CREDITS -28**

COURSE CODE	COURSE TITLE	CREDITS	HRS/ WK	TOTAL HOURS	L-T-P	CA	SE	TOTAL
10SP18/2C/TEB	CorePaper-III Taxonomy and Economic Botany of Angiosperms	4	5	75	3-2-0	40	60	100
10SP18/2C/AEP	CorePaper-IV Developmental Botany - Anatomy, Embryology and Palynology of Angiosperms	4	4	60	3-2-0	40	60	100
10SP18/2C/EPE	CorePaper-V Ecology, Phytogeography and Evolution	4	4	60	3-1-0	40	60	100
10SP18/2C/PR1	Practical – I: Covering Core Papers - I & II	4	-	-	-	40	60	100
10SP18/2C/PR2	Practical - II: Covering Core Papers III, IV & V	4	8	120	0-0-8	40	60	100
10SP18/2E3/HTE (or) 10SP18/2E3/ETB	Elective-III Herbal Technology (or) Ethnobotany	3	3	45	2-2-0	40	60	100



10SP18/2E/EBO	Extra Disciplinary- I Entrepreneurial Botany (offered to other Department students)	3	4	60	3-0-0	40	60	100
	Soft skill-II	2	2	30		-	50	50

## SEMESTER-II

### CORE PAPER- IV TAXONOMY AND ECONOMIC BOTANY OF ANGIOSPERMS

Teaching hours: 5 / Week  
75/ Semester

COURSE CODE-10SP18/2C/TEB  
Credits: 4  
L-T-P  
3- 2- 0

#### COURSE OBJECTIVES:

To enable the students to

1. Expose to modern trends in classification.
2. Acquire scientific knowledge of plant resources.
3. Describe and compare the distinguishing features of angiosperm families.
4. Develop skills to handle plant identification and floristic work.
5. Impart the application of botanical knowledge to the well being of mankind.

#### COURSE OUTLINE:

##### UNIT – I

(15Hrs)

Taxonomy and systematics, objectives of plant systematics, hierarchy. Systems of classification – Artificial (Linnaeus), Natural (Bentham & Hooker), Phylogenetic (Takhtajan), Modern (APG). Tools- Flora, Manual, Types of keys and its uses, DNA Bar Coding, Botanical Gardens & Herbaria.

##### UNIT – II

(15Hrs)

Modern trends in Taxonomy - numerical taxonomy - chemotaxonomy - Biosystematics. Botanical Survey of India- its organization and role. ICBN- Importance and principles of binomial nomenclature - Valid and effective publication, Citation, rejection and retention of names, Typification, Limitation to priority.

##### UNIT- III

(15Hrs)

A detailed study of the following families and their interrelationships and phylogeny:

1. Ranunculaceae
2. Magnoliaceae
3. Menispermaceae
4. Brassicaceae
5. Portulacaceae
6. Sterculiaceae
7. Tiliaceae.
8. Meliaceae
9. Rhamnaceae
10. Vitaceae
11. Sapindaceae
12. Anacardiaceae
13. Moringaceae
14. Rosaceae
15. Combretaceae

#### UNIT – IV

(15Hrs)

16. Turneraceae
17. Passifloraceae
18. Aizoaceae
19. Apiaceae
20. Oleaceae
21. Boraginaceae
22. Solanaceae
23. Bignoniaceae
24. Verbenaceae
25. Nyctaginaceae
26. Casuarinaceae
27. Commelinaceae
28. Amaryllidaceae
29. Arecaceae
30. Cyperaceae

#### UNIT - V: Economic Botany

(15Hrs)

Origin, evolution, botany, cultivation and uses of (i) food, (Finger Millet, Tapioca, Black gram) : forage and fodder crops (Sorgham, Napier's grass ), (ii) Fibre crops (Hemp, Jute). (iii) Medicinal and aromatic plants (*Acorus calamus*, *Aloe vera*, *Withania somnifera* and *Phyllanthus amarus*) (iv) vegetable oil yielding plants (Sesame, Coconut, Palm). Important fiber - wood and timber yielding plants and non-wood forest products (NWFPs) such as

*Bambusa rattens*, raw materials for paper making, gums, tannins, dyes, resins and fruits  
Plants used as avenue trees for shade, pollution control and aesthetics. Energy plantation -  
cultivation and uses of *Casuarina* and *Eucalyptus*.

### RECOMMENDED TEXT BOOKS

1. Pandey.B.P., 1997 – Taxonomy of Angiosperms.
2. Pandey.B.P. (1987) – Economic Botany.
3. Verma. V (1984) – Economic Botany.
4. Gokhale.S.B (1992) – Pharmacognosy. S.Chand & Co.
5. Ansari.S.H. (1993) – Pharamacognosy S.Chand & Co.
6. Sivarajan. S.(1993) - Introduction to Principles of Taxonomy. Oxford. IBH New Delhi.

### REFERENCE BOOKS

1. Lawrence.G.H.M, 1985 – An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Porter.C.L., 1982 – Taxonomy of Flowering Plants, Eurasia Publications House, New Delhi.
3. Rendle.A.B., 1980 – The Classification of Flowering Plants (Vol. I & II), Vikas Students Education.
4. Hill.A.W. (1981) – Economic Botany, McGraw Hill Pub.
5. Willis.T.E(1994) – Text Book of Pharmacognosy. Tata McGraw Hill Publishers.

### JOURNALS:

1. **Botanical Journal of Linnean Society**
2. **Annals of Botany**

### E LEARNING RESOURCES:

- 1.[https://www.brainkart.com/article/Angiosperm-phylogeny-group-\(APG\)-classification\\_32976/](https://www.brainkart.com/article/Angiosperm-phylogeny-group-(APG)-classification_32976/)
- 2.<http://bio.slu.edu/mayden/systematics/bsc420520lect2.html>
- 3.[http://edis.ifas.ufl.edu/topic\\_plant\\_families](http://edis.ifas.ufl.edu/topic_plant_families)
- 4.[http://www.bsienvi.nic.in/Database/Angiosperms\\_of\\_India\\_26171.aspx](http://www.bsienvi.nic.in/Database/Angiosperms_of_India_26171.aspx)
- 5.[http://edis.ifas.ufl.edu/topic\\_plant\\_families](http://edis.ifas.ufl.edu/topic_plant_families)

**COURSE OUTCOMES:**

<b>CO.No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Discuss different systems of classification of flowering plants including recent APG system	K4
<b>CO 2</b>	Analyze the general principles and modern trends in taxonomy of angiosperms	K4
<b>CO 3</b>	Write the technical description of the prescribed families followed by phylogenetic consideration.	K3
<b>CO 4</b>	Analyse family characteristics with illustrations depicting flowering twigs, floral structures and floral diagrams	K3, K4
<b>CO 5</b>	Apply the knowledge on plant products in Industries	K3

**MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning,  
Field Visits.

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**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER- IV**

**TAXONOMY AND ECONOMIC BOTANY OF ANGIOSPERMS**

**COURSE CODE-10SP18/2C/TEB**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**CORE PAPER-V**

**DEVELOPMENTAL BOTANY- ANATOMY, EMBRYOLOGY AND PALYNOLOGY  
OF ANGIOSPERMS**

**COURSE CODE-10SP18/2C/  
AEP**

**Teaching hours: 4 / Week**

**Credits: 4**

**60/Semester**

**L-T- P**

**3- 1- 0**

### **COURSE OBJECTIVES:**

To enable the students to

1. Understand the tissues and its types in plant systems.
2. To enable the students knowledge on secondary growth in plants and its abnormalities.
3. To introduce the learners about the embryology of angiosperms.
4. To impart knowledge on morphogenesis and its applications.
5. To study the recent advances in palynology.

### **COURSE OUTLINE:**

#### **UNIT - I: Anatomy**

**(10Hrs)**

**Tissue** – Outline, Classification. Organization and theories regarding shoot, root and floral meristems, Vascular cambium - origin, development and types. Cambial activity - normal and anomalous. Cork cambium, Periderm, polyderm, rhytidome, lenticels. Xylem, xylary elements – differentiation. **Maceration technique** - tracheids, vessels, fibre and parenchyma Patterns of secondary wall thickening. Tyloses; reaction wood, heart wood and sap wood. Growth rings. Phloem - primary and secondary elements - ontogeny-differentiation. Structural variations and characteristics of phloem components. Anomalous thickening in Dicot and Monocot stem.

#### **UNIT - II**

**(15Hrs)**



Secretory cells and tissues; their structure, classification and significance. Types- external and internal secretory structures. Nodal anatomy - uni, tri & multilacunar, Kranz anatomy. Stomata - development and types. Applied plant anatomy in paper and fibre industry.

### **UNIT - III: Embryology**

**(10Hrs)**

Microsporogenesis, Morphology, cytology and physiology of tapetum Microgametogenesis – microspore, division of generative cell, pollen wall morphogenesis and structural variability. Pollen fertility and sterility, Pollen germination, Pollen storage. Ovule-types, Megasporogenesis - Megagametogenesis, Embryosac development and types, ultrastructure of egg, synergids and antipodals.

### **UNIT - IV**

**(15Hrs)**

Fertilization - discharge and movement of sperms. Syngamy and triple fusion; post-fertilization changes. Heterofertilization. (double fertilization). Endosperm - types, endosperm haustoria, Embryogeny -Laws of Embryogeny - Classification – mono and dicot embryos - variations and differences in development, Apomixis. Polyembryony. Embryology in relation to Taxonomy.

### **UNIT - V: Palynology**

**(10Hrs)**

Palynology - aeropalynology - pollen allergy and palynological calendars. Pollen analysis of honey; pollen loads. Paleopalynology - role in coal and oil genesis. Recent advances in palynological studies.

### **RECOMMENDED TEXT BOOKS**

1. Pandey, B.P. 21<sup>st</sup> edition (2012). Plant Anatomy. S. Chand & Co. Ltd., New Delhi.
2. Fahn. A. 2010. Plant Anatomy. Mac Millon
3. Bhojwani.S.S. and Bhatnagar . S.P., Dantu P.K. The Embryology Of Angiosperms, Vikas Publications House Private ltd., 2015.
4. Singh, V., Pande, P.C. and Jain, D.K. (1987). Anatomy of Seed Plants. Rastogi Publications, Meerut.
5. Maheswari.P. 1991. Embryology of Angiosperms. Oxford. IBH. Delhi
6. Narayanaswamy. S. 1994. Plant Cell and Tissue Culture. Tata McGraw Hill Ltd. New Delhi.
7. Tayal, M.S. –Plant Anatomy.1996 5<sup>th</sup> edition.

### **REFERENCE BOOKS**

1. Cutter, E. G. (1978).Plant Anatomy. Edward Arnold Publishers Ltd., London.Davies . P. H. and Heywood. V. H. 1967. Principles of Angiosperm taxonomy. Oliver and Byod. Edinborough

2. .Davies. G. L Systemic Embryology of Angiosperms,
3. Dixon. A. 1985. Plant Cell Culture- A practical Approach IRL press. Oxford
4. Ertman.G. 1954. An Introduction to Pollen Analysis. Cronica Botanica.
5. Hutchinson. J. 1973. The Families of Flowering Plants. Oxford Uni. Press.
6. Johri. B. M. 1984. Embryology of Angiosperms. Springer Verlaug.
7. Lawrence. G. H. Introduction to Vascular Plants. Oxford. IBH. Delhi.
8. Nair. P. K. K. 1985. Essential of Palynology
9. Carlquist.S. 1961. Comparative Plant Anatomy. Holt Richart
10. Cutter. E. G. Plant Anatomy- Experimental and Interpretation
11. .Gray. P. 1964. Hand Book of Plant Microtechnique.
12. Jenson. W. A. 1962. Botanical Histochemistry. The Benjamin/ Cunnings

## **JOURNALS**

Journal of Morphology and Anatomy

Journal Palynology

## **E-LEARNING RESOURCES**

1.<https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/embryogenesis>

2.[https://www.researchgate.net/publication/318394791\\_Plant\\_Anatomy\\_and\\_Embryology/link/59675b44458515e9af9e9f6a/download](https://www.researchgate.net/publication/318394791_Plant_Anatomy_and_Embryology/link/59675b44458515e9af9e9f6a/download)

3.<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/plant-anatomy>

4.<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/palynology/pdf>

5.[https://www.researchgate.net/journal/0034-6667\\_Review\\_of\\_Palaeobotany\\_and\\_Palynology](https://www.researchgate.net/journal/0034-6667_Review_of_Palaeobotany_and_Palynology)

## **COURSE OUTCOMES**

<b>CO.No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Outline the the types of tissues in plant kingdoms.	K3
<b>CO 2</b>	Compare the anatomical structures and its abnormalities.	K3, K4
<b>CO 3</b>	Explain the development of male and female	K3



	gametophytes	
<b>CO 4</b>	Compile the types of endosperms, morphogenesis, polyembryony and its uses.	K3,K4
<b>CO 5</b>	Discuss Palynology- its scope and applications.	K4

### Mapping of CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	2	2	3	3
<b>CO 2</b>	3	2	2	3	3
<b>CO 3</b>	3	1	2	3	3
<b>CO 4</b>	3	1	1	3	3
<b>CO 5</b>	2	2	3	3	3
<b>Average</b>	2.8	1.6	2.0	3	3

### TEACHING METHODOLOGY:

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning.

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**M. Sc DEGREE EXAMINATION**

**I M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER-V**

**DEVELOPMENTAL BOTANY- ANATOMY, EMBRYOLOGY AND PALYNOLOGY  
OF ANGIOSPERMS**

**COURSE CODE-10SP18/2C/ AEP**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**CORE PAPER –VI**

**ECOLOGY, PHYTOGEOGRAPHY AND EVOLUTION**

**COURSE CODE-10SP18/2C/  
EPE**

**Teaching hours: 4 / Week**

**Credits: 4**

**60/ Semester**

**L-T- P**

**COURSE OBJECTIVES:**

**3- 1- 0**

To enable the students to

1. Understand the basic concepts in ecosystem and phytogeography.
2. Learn about Phytogeography and remote sensing.
3. Study about conservation of biodiversity.
4. Impart knowledge on global issues concerned with environment.
5. Know about the origin of life and evolution of life forms.

## **COURSE OUTLINE:**

### **UNIT - I:**

**(15Hrs)**

**Ecological Principles** : Physical environment /Abiotic environment, biotic environments; their interactions concept of habitat & niche. Diversity of plant life; growth form, life form (Raunkaier's). Productivity and Measurement. **Plant Succession** – Hydrosere, Xerosere.

**Ecosystem Ecology**: Structure, function, methods of studying vegetation – Transect, Quadrat, Species Area Curve, food chain, food web, energy flow, nutrient cycling (C, N, P, S). Terrestrial ecosystem & aquatic ecosystem. **Environmental pollution**, effects & control measures.

### **UNIT - II:**

**(10Hrs)**

**Population Ecology**: Population characteristics; **Population growth curves**; **Demography**, structure, mortality, natality, age and distribution. **Levels of species diversity** and its measurements; edges and ecotones.

### **UNIT - III:**

**(15Hrs)**

**Conservation Ecology** : **Principles of conservation**; Sources and their management strategy with suitable examples (Biosphere reserves etc.) **Disaster Management**. Global Environmental change. Biodiversity: Status, monitoring and documentation. Endangered plants of India. **IUCN** category of endangered species.

### **UNIT - IV:**

**(10Hrs)**

**Phytogeography and Remote sensing**: Plant distribution types – continuous, discontinuous, age and area hypothesis. **Major Biomes of the world**; bio-geographical zones of India; theory of island biogeography; Continental drift; principles of **Remote sensing and its applications**. **Vegetation Mapping through GIS**.

### **UNIT - V:**

**(10Hrs)**

**Evolution:** Origin of life, theories of evolution – Darwin, Lamarck and De veries, chemosynthetic theory. Molecular evolution. Variation in nature – sources and analysis of variation. Origin of species – isolation mechanisms.

### **RECOMMENDED TEXT BOOKS**

1. Ambasht, R. S. (2008). A text book of plant ecology. 15<sup>th</sup> Edition. Students & Friends and Co., Varanasi, India.
2. Kumar, H. D. (1997). General Ecology. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Odum, F. E. (1971). Fundamentals of Ecology. W.B. Saunders & Co., New Delhi.
4. Shukla R.S and Chandel P.S (2012) A text book of plant ecology. S Chand
5. Sharma, P.D. (2000) : Ecology & Environment Rastogi Publications, Meerut, India-7=653pp.,
6. Verma P.S and Agarwal V.K (2015) Cell biology, genetics, molecular biology, evolution and ecology S.Chand

### **REFERENCE BOOKS**

1. Fahey, T.J. and Knapp, A.K. 2007. Principles and Standards for Measuring Primary Production. Oxford.
2. Grant, W.E. and Swannack, T.M. 2008. Ecological Modeling. Blackwell.
3. Wilkinson, D.M. 2007. Fundamental Processes in Ecology: An Earth system Approach. Oxford.
4. APHA, (1985). Standard methods for the examination of water and waste water. APHA, Washington, DC.
5. Barry, Cox, C and Peter D. Moore (2005). Biogeography: an ecological and evolutionary approach. Blackwell Pub., Co., London.
6. Chapman (1999). Ecology - Principles and applications. Cambridge University Press, Foundation Books, New Delhi. .
7. Robinson, H. (1978). Biogeography. ECBS & Mac Donald and Evans, London.
8. Crawley, M (2007). Plant ecology. Blackwell scientific Publications.
9. Moore and Chapman, (2007). Methods in plant Ecology. Blackwell ScientificPublications.
10. Russell K. Monson, (2014). Ecology and the Environment. Springer Dordrecht, Heidelberg, New York.

### **JOURNAL REFERENCE**

1. North Asian International research Journal consortiums
2. International Journal of Science and Research (IJSR)

### **E LEARNING RESOURCES:**

1. [1. https://www.eolss.net/Sample-Chapters/C09/E6-38A-01-03.pdf](https://www.eolss.net/Sample-Chapters/C09/E6-38A-01-03.pdf)
2. [2. https://shodhganga.inflibnet.ac.in/bitstream/10603/8449/6/06\\_chapter%201.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/8449/6/06_chapter%201.pdf)
3. [3. http://pdf.wri.org/environmentalpollution\\_bw.pdf](http://pdf.wri.org/environmentalpollution_bw.pdf)
4. [4. https://pdfs.semanticscholar.org/8e7b/a9595bab30d7ea87715533353c53f7452811.pdf](https://pdfs.semanticscholar.org/8e7b/a9595bab30d7ea87715533353c53f7452811.pdf)
5. [7. http://www.fao.org/3/i3157e/i3157e10.pdf](http://www.fao.org/3/i3157e/i3157e10.pdf)
6. [8. http://www.wamis.org/agm/pubs/agm8/Paper-2.pdf](http://www.wamis.org/agm/pubs/agm8/Paper-2.pdf)
7. [9. https://pdfs.semanticscholar.org/53ff/76eb3ef9291186f235a59b2ad6214f8cf35d.pdf](https://pdfs.semanticscholar.org/53ff/76eb3ef9291186f235a59b2ad6214f8cf35d.pdf)

8. [http://www.scielo.br/pdf/ea/v21n59/en\\_a21v2159.pdf](http://www.scielo.br/pdf/ea/v21n59/en_a21v2159.pdf)  
 9. [www.press.uchicago.edu/dam/ucp/books/pdf/course\\_intro/978-0-226-34214-6\\_course\\_intro.pdf](http://www.press.uchicago.edu/dam/ucp/books/pdf/course_intro/978-0-226-34214-6_course_intro.pdf)&cd=29&hl=en&ct=clnk&gl=in

## COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Analyse about the interaction between biotic and abiotic components of the environment and plant diversity	K4, K3
CO 2	Discuss the concept of ecosystem of structure, function, energy flow, food chain , food web and nutrient cycles.	K3
CO 3	Evaluate about consequences in the environment and its control measures	K4,K5
CO 4	Explain Phytogeography , conservation of biodiversity, remote sensing, population ecology	K4, K5
CO 5	Outline theories of evolution, origin of life and species	K2

## Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	1	3	3
CO 4	3	3	3	3	3
CO 5	3	1	1	2	3
Average	3	2.6	2	2.8	3

## TEACHING METHODOLOGY:

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning,

Field Visits.

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**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER –VI**

**ECOLOGY, PHYTOGEOGRAPHY AND EVOLUTION**

**COURSE CODE-10SP18/2C/ EPE**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>

<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**PRACTICAL-II: COVERING THEORY PAPERS III, IV AND V**

**10SP18/2C/PR2**

**Teaching hours : 8/ Week**

**120/ Semester**

**COURSE**

**CODE-**

**Credits : 4**

**L-T- P**

**0-0- 8**

**COURSE OBJECTIVES**

To enable the students to

1. Classify angiosperm taxa.
2. Gain knowledge on the economic importance of plants and their products.
3. Examine the anatomical details of angiosperms.
4. Study the reproductive structures of angiosperms.
5. Interpret the vegetation of an ecosystem.

## **COURSE OUTLINE:**

### **Taxonomy and Economic Botany of Angiosperms**

Description of a species, based on herbarium and live specimens of the families mentioned in the theory.

Solving nomenclature problems

Field visits for at least 2-3 days within and outside Tamil Nadu to collect specimens on the spot. Submission of not less than 20 herbarium sheets representing the families studied (within and outside Tamilnadu)

### **Ecology and Remote Sensing**

1. Determination of air temperature at different altitudes (Ground Level 50, 100 and 150m).
2. Determination of air temperature at 2 hourly interval starting from 6 am to 6p.m.
3. Determination of the minimum size of quadrat by species area curve.
4. Determination of the quantitative characters of a plant community by random quadrat method (abundance, density, dominance, species diversity, frequency).
5. Determination of the quantitative characters by belt transect method
6. Evaluation of life form classes of the local flora and preparation of biological spectrum of land.
7. Estimation of above ground and below ground biomass employing minimum size of quadrat.
8. Determination of soil moisture content by oven drying method.
9. Determination of water holding capacity.
10. Determination of pH of soil and water by universal indicator (or) pH meter.
11. Mapping of World vegetation
12. Mapping of Indian vegetation.
13. Instruments

### **Anatomy**

Laboratory work on the basis of topics listed under angiosperm anatomy theory. Micrometry in anatomical studies-ocular, stage and camera lucida-types. Techniques in making temporary and permanent microscopic preparations - free hand, peelings, clearing, maceration and wood section. Submission of not less than 5 permanent slides.

### **Embryology and Palynology**

Preparation of dissected whole mounts of embryo. Study of pollen (Acetolysis and non-acetolysis) Collection and Identification of local aerospora. Study from permanent preparation: - Development and structure of anther, Pollen, Ovule, megasporogenesis, embryosac, endosperm and embryo. SEM diagrams of Pollen Grains.



## COURSE OUTCOMES

CO No.	CO Statement
CO 1	Identify angiosperm taxa
CO 2	Assess economic value of plant products
CO 3	Discuss the anatomical relations among angiosperms
CO 4	Analyse the application of pollen grains
CO 5	Evaluate the impact of various environmental factors on biodiversity and their distribution

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

I M. Sc., PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

PRACTICAL EXAMINATION

TITLE OF THE PAPER: PRACTICAL –II

Max Marks- 100

PAPER CODE: 10SP18/2C/PR2

Practical- 70

Record- 10

Herbarium-10

Slides - 5

Viva-voce- 5

Time- 4 hrs

1. Find the binomial of **A** and **B** using Gamble's flora.  
(2x3=6)
2. Refer **C** and **D** to their respective families giving reasons. Indicate the taxonomic hierarchy.  
(2x3=6)
3. Cut L.S of flower and T.S of ovary of the specimen **E**. Construct floral diagram and write the floral formula. **Submit the preparation** for valuation.  
(4)

4. Cut transverse section of **F** and **submit the slide** for valuation. Draw a labeled sketch and identify giving reasons.  
(6)
5. Investigate the macerate **G**. Identify the elements and draw diagrams. (4)
6. Identify the nodal type / stomatal type of **H**, draw labeled sketches giving reasons.  
**Submit the slide** for valuation. (5)
7. Dissect and display any one developmental stage of embryo of **I** giving reasons.  
**Submit the preparations. Diagrams not necessary.**  
(4)
8. Write protocol for acetolysis, draw the ornamentation of the pollen grains given in **J**.  
**Submit the slide** for valuation. (4)
9. Determine the distribution and frequency of vegetation in the given quadrat **K**. Write the procedure, record the data and give your interpretations. (6)
10. Estimate the water holding capacity of soil **L**. (6)
11. Spot at sight – write **genus** and **family name only** for **M** and **N**.  
(2x2=4)
12. Identify and comment on **O, P, Q, R** and **S**.  
(5x3=15)

### ELECTIVE-III: HERBAL TECHNOLOGY

	COURSE	CODE-
	10SP18/2E3/HTE	
Teaching hours: 3 / Week	Credits: 3	
45/ Semester	L-T- P	
	2- 1- 0	

#### COURSE OBJECTIVES:

To enable the students to

1. Understand the scope and importance Pharmacognosy.
2. Learn about cultivation and processing of medicinal plants.
3. Study about secondary metabolite production and its applications.
4. Impart knowledge about nature of phytochemicals.
5. Get knowledge about herbal drug and traditional formulations.

## COURSE OUTLINE:

### UNIT - I

(10Hrs)

Pharmacognosy scope and importance - source - Classification (Taxonomical, Morphological Chemical, Pharmacological); Cultivation, Collection & processing of Crude Drugs. Medicinal & Aromatic Plants-Cultivation and Utilization of Medicinal & Aromatic Plants in India.

### UNIT - II

(8Hrs)

Phytochemicals through plant tissue culture, Role of Plant tissue culture in enhancing secondary metabolite production (*Withania somnifera*, *Rauwolfia serpentina*, *Catheranthus roseus*, *Andrographis paniculata*, *Dioscorea sp.*) - Elicitation - Biotransformation, Hairy root culture. Factors affecting secondary metabolites production. Biogenesis of Phytopharmaceuticals.

### UNIT - III

(10Hrs)

**Types of Phytochemicals** - Carbohydrates & derived products; Glycosides (Digitalis, Aloe, Dioscorea.); Tannins (Hydrolysable & Condensed types); Volatile Oils (Clove, Mentha).

### UNIT - IV

(7Hrs)

**Types of Phytochemicals** - Alkaloids (Taxus, Papaver, Cinchona); Flavonoids; Resins. Application of phytochemicals in phytopharmaceuticals, Biocides, Biofungicides, Biopesticides.

### UNIT - V

(10Hrs)

**Analysis of Phytochemicals:** Drug development – preclinical experiments, clinical experiments. Methods of Drug evaluation (Morphological, Microscopic, Physical & Chemical). Preliminary screening, Assay of Drugs - Biological evaluation / assays, Microbiological methods- Chemical Methods of Analysis, Detection of Adulterants: Chemical estimations, Spectrophotometry & Fluorescence analysis. Drug adulteration - Types of adulterants.

## RECOMMENDED TEXT BOOKS

1. Pharmacognosy, C. K. Kokate, A. P. Purohit & S. B. Gokhale (1996), Nirali Prakashan, 4th Ed.
2. Cultivation & Processing of Medicinal Plants, Chichister, U. K: J. Wiley & Sons. Trease & Evans.
3. K.C.Kokate, A.P.Purohit, S.B.Gokhale. Pharmacognosy. Nirali Prakashan. 2008. Pune.

## REFERENCE BOOKS

1. Natural Products in medicine: A Biosynthetic approach (1997), Wiley. Hornok,L. (ed.) (1992).
2. Pharmacognosy – William Charles Evans, 14th ed. (1989), Harcourt Brace & Company.

#### JOURNALS

1. Phytotherapy
2. World Journal Of Pharmacy And Pharmaceutical Sciences
3. Journal of Medicinal Plants Studies
4. Journal of pharmacognosy and phytochemistry
5. ACS –Natural Product Chemistry

#### E LEARNING RESOURCES:

1. <http://www.yourarticlelibrary.com/pharmacognosy/crude-drugs-cultivation-collection-processing-and-storage/49405>
2. [harmatutor.org/pharmacognosy/cultivation-methods.html](http://harmatutor.org/pharmacognosy/cultivation-methods.html)
3. [https://www.nmpb.nic.in/sites/default/files/publications/Good\\_Field\\_Collection\\_Practices\\_GFCPs\\_Booklet-Part-I.pdf](https://www.nmpb.nic.in/sites/default/files/publications/Good_Field_Collection_Practices_GFCPs_Booklet-Part-I.pdf)
4. <https://academic.oup.com/chromsci/article/55/3/232/2547730>
5. <https://pdfs.semanticscholar.org/4dba/b6f76e0ac0bf2e592624f1f73867e2cc40e6.pdf>

#### COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Discuss the scope and importance , classification, collection and processing of herbal drugs, cultivation and utilization of medicinal and aromatic plants	K2, K3
CO 2	Apply various technique enhancing secondary metabolite production in tissue culture and its factors affecting	K3
CO 3	Analyse phytochemicals – Carbohydrates, glycosides,tannin and volatile oil	K4
CO 4	Compare various phytochemicals , types and applications in Phytopharmaceuticals	K4
CO 5	Evaluate Drug development , drug evaluation , preliminary screening and detection of adulterant	K5

#### Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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CO 1	3	3	1	3	3
CO 2	3	3	1	3	3
CO 3	3	3	1	3	3
CO 4	3	3	1	3	3
CO 5	3	3	1	3	3
Average	3	3	1	3	3

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning.

**Note: No Practical for this paper.**

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE-III: HERBAL TECHNOLOGY**

**COURSE CODE-10SP18/2E3/HTE**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

### **ELECTIVE-III: ETHNOBOTANY**

**COURSE  
10SP18/2E3/ETB**

**CODE-**

**Teaching hours: 3 / Week**

**Credits: 3**

**45/ Semester**

**L-T- P**

**2- 1- 0**

#### **COURSE OBJECTIVES:**

To enable the students to

1. Study about scope and importance of ethnobotany.
2. Understand the basic knowledge and nature of ethnobotanical data.
3. Acquire ethnobotanical knowledge about plants, culture and religious activities.
4. Know the commercial use of traditional knowledge.
5. Impart knowledge on IPR.

#### **COURSE OUTLINE:**

##### **UNIT – I**

**(10Hrs)**

Ethnobotany: concepts and definitions. Subdisciplines of ethnobotany. Interdisciplinary approaches. Knowledge of following sociological and anthropological terms: culture, values and norms, institutions, culture diffusion and ethnocentrism. History of Ethnobotany: A brief history of ethnobotanical studies in the world and in India.

##### **UNIT - II**

**(10Hrs)**

Distribution of tribes in India. Basic knowledge of following tribes of Tamil Nadu: Irulas, Kanis, Paliyars and Malayalis.

### **UNIT – III**

**(7Hrs)**

Sources of ethnobotanical data: Primary - archeological sources and inventories, Secondary - travelogues, folklore and literary sources, herbaria, medicinal texts and official records. Methods in ethnobotanical research. Prior Informed Consent, PRA techniques, interviews and questionnaire methods, choice of resource persons.

### **UNIT – IV**

**(8Hrs)**

Ethnobotanical knowledge and communities: Folk Taxonomy Plants associated with culture and socio-religious activities. Non timber Forest Produce (NTFP) and livelihood Sustainable harvest & value addition.

### **UNIT – V**

**(10Hrs)**

Bioprospecting and commercial use of traditional knowledge. Developing research partnerships: Codes of ethics and research guidelines, equitable research relationships, Traditional knowledge (TK) in relation to Intellectual Property Rights and Biopiracy. Equitable Benefit sharing models of the world. Problems in equitable benefit sharing.

### **RECOMMENDED BOOKS**

1. JAIN, S.K. 1991. Contributions to Indian Ethnobotany. Scientific Publishers. Jodhpur.
2. JAIN, S.K. 1991. Dictionary of Indian folk medicine and Ethnobotany. Deep Publishers. New Delhi.
3. JAIN, S.K. AND V. MUDGAL. 1999. A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehra dun.
4. RASTOGI, R.P., AND B.N. MEHROTRA. 1993. Compendium of Indian Medicinal Plants. Vol.I & Vol. II. CSIR. Lucknow. Publications and Information Directorate. New Delhi.
5. SINGH, K.S. 1998. India's Communities. Oxford University Press, Delhi. Vols. I – VI.

### **REFERENCE BOOKS**

1. Apte, T. 2006. Intellectual Property Rights, Biodiversity and Traditional Knowledge. Kalpavriksh, Grain & IIED, Pune / New Delhi.
2. BALEE W. L. 2003. Footprints of the Forests. Bishen Singh Mahendar Pal Singh, Dehra Dun, India.
3. COTTON, C. M. 1997. Ethnobotany – Principles and Applications. John Wiley and Sons Limited. New York, USA.

4. CSIR. 1940 - 1976. Wealth of India. A Dictionary of Raw Materials and Industrial Products - Raw Materials. Vol.1-11. CSIR Publication & Information Directorate. New Delhi.
5. CUNNINGHAM, A.B. 1993. Ethics, Ethnobiological Research, and Biodiversity. WWF. International Publication. Switzerland.
6. DAVID, N AND C. KRAMER. 2001. Ethnoarchaeology in Action. Cambridge University Press, New York.
7. Duthfield, G. 2004. Intellectual Property, Biogenetic Resources and Traditional Knowledge. Earthscan, London, UK..
8. JAIN, S.K. 1989. Methods and Approaches in Ethnobotany. Society of Ethnobotanists. Lucknow.
9. KATE, K. T., S. A. LAIRD. 2000. Commercial Use of Biodiversity. Earthscan, London, UK.
10. LAIRD, S.A. 2002. Biodiversity and Traditional knowledge Equitable partnerships in Practice. Earthscan Publications Ltd., London.

### **COURSE OUTCOMES**

<b>CO No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Discuss about history, concepts, definitions of ethnobotany	K3
<b>CO 2</b>	Identify distribution and knowledge of tribes in India and Tamilnadu	K3
<b>CO 3</b>	Plan for sources of ethnobotanical data, interviews and questionnaire	K4
<b>CO 4</b>	Analyse ethonobotanical knowledge of plants, non timber forest, culture and religious	K4
<b>CO 5</b>	Explain Bioprospecting, commercial use of traditional knowledge in IPR, biopiracy, equitable benefits	K4

### **TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning,

**Note: No Practical for this paper.**



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**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE-III: ETHNOBOTANY**

**COURSE CODE-10SP18/2E3/ETB**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**EXTRA DISCIPLINARY-I**  
**ENTREPRENEURIAL BOTANY**  
(Offered to other Department students)

	<b>COURSE</b>	<b>CODE-</b>
	<b>10SP18/2E/EBO</b>	
<b>Teaching hours: 4/ Week</b>	<b>Credits: 3</b>	
<b>60/ Semester</b>	<b>L-T- P</b>	
	<b>2- 2- 0</b>	

**COURSE OBJECTIVES:**

To enable the students to

1. Understand the mushroom cultivation and marketing.
2. Study the importance and scope of Gardening.
3. Learn vegetable carving, floral arrangement, Bonsai technique, Topiary, Floriculture and marketing.
4. Impart knowledge on food preservation, food spoilage, vermicomposting, organic farming.
5. Educate them about the entrepreneurial potential, entrepreneurship-funding agencies and importance of entrepreneurship development programme.

**COURSE OUTLINE:**

**UNIT - I**

**(10Hrs)**

Introduction and scope of **mushroom cultivation**-biology and cultivation of paddy straw and oyster mushroom –nutritional values and uses-diseases-post harvest technology-Marketing packing, storage and recipes.

**UNIT - II**

**(10Hrs)**

History and importance of gardening: garden tools – different types of gardens-rockery, water garden-lawn formation and maintenance. Landscape layout gardening. Nursery structure and maintenance.

### **UNIT – III**

**(15Hrs)**

Vegetable carving and floral arrangement. Importance of green house. Bonsai technique and topiary. Floriculture- rose and jasmine and cut flowers-cultivation and marketing- bouquet making.

### **UNIT - IV**

**(15Hrs)**

Food spoilage-causes-preservation of fruits and vegetables- principles-different method of preservatives-canning of fruits and vegetables-mango and carrot, drying of fruits - Banana and dates, preparation of juices – methods of canning , packing technology.

### **UNIT – V**

**(10Hrs)**

Vermicomposting and organic farming, methods of organic farming, vermicomposting-methods-preparations. Entrepreneurship-funding Agencies for promoting green industries-Entrepreneurship development programme (EDP) need and importance.

### **RECOMMENDED BOOKS**

1. Manibhushan Rao, K 1991 Text book of Horticulture.MacMillan India private Limited New Delhi.
2. Prasad S and Kumar 1999 Principles of Horticulture. Agrobotanica.Bikander India.
3. B.C. Suman, V. Sharma, B. Suman, V.P. Sharma Mushroom Cultivation in India. 2007. Daya pub house.Delhi.
4. Gurcharan Singh Randhawa, Amitabha Mukhopadhyay. Floriculture in India.1986.Allied Publishers.Ltd.Bombay.
5. Bhupendra Singh Khatkar .Food Science and Technology 2007. Daya pub house.Delhi.

### **REFERENCE BOOKS**

- 1, Brig,Harmander Singh 1991. Mushroom- The art of cultivaitaion. Sterling Pubnlshers.
2. Mathew IP and Karikari 1994 Horticulture; Principles and practice MacMillan Press Limited New Delhi
3. Marshall Woodrow.G 1999 Gardening in India, Biotech Books New Delhi.
4. Mary Violet Christy A.( 2014) Vermitechnology ,MJP Publisher.
5. R.P.Srivastava, Sanjeev Kumar (2013) Fruit and Vegetable Preservation : Principles and Practices ( 3rd Edition )
6. Kumar N (Pb 2016) Introduction To Horticulture 7Ed . Oxford & IBH Publishing Company Pvt. Limited,

**JOURNALS:**

1. International Journal of Horticulture & Agriculture
2. Indian Horticulture Journal

**E-LEARNING RESOURCES:**

1. <https://farmer.gov.in>chap9pdf>
2. <nhb.gov.in>pdf>Cultivation>
3. <https://edis.ifas.ufl.edu/pdffiles/MG/MG08600.pdf>
4. [https://edblog.hkedcity.net/te\\_tle/wp-content/blogs/1685/uploads/FST/Food%20Booklet%2010%20eng.pdf](https://edblog.hkedcity.net/te_tle/wp-content/blogs/1685/uploads/FST/Food%20Booklet%2010%20eng.pdf)
5. <http://www.hillagric.ac.in/edu/coa/agronomy/lect/agron-3610/TeachingManual-Organic-Farming-3610-2016.pdf>

CO.No.	CO Statement	Knowledge Level
CO 1	Demonstrate mushroom cultivation and marketing	K3
CO 2	Discuss the techniques of gardening & tools	K3, K5
CO 3	Explain vegetable carving, floral arrangement, Bonsai technique, Topiary, Floriculture and marketing	K3, K5
CO 4	Analyse food preservation, food spoilage and packing technology	K4, K5
CO 5	Outline vermicomposting, organic farming, entrepreneurship-funding agencies and importance of entrepreneurship development programme.	K4, K5

**Mapping of CO with PSO**

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	3
CO 2	3	2	2	3	3
CO 3	3	2	2	3	3
CO 4	3	2	2	3	3
CO 5	3	2	2	3	3
Average	3	2	2	3	3

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
 E Content, Videos/ Animation,  
 Quiz-Seminar,  
 Peer Learning,  
 Field Visits.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**EXTRA DISCIPLINARY-I**

**ENTREPRENEURIAL BOTANY (offered to other Department students)**

**COURSE CODE-10SP18/2E/EBO**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K3</b>	<b>B-5/8X8 marks</b>	<b>500</b>	<b>40</b>	<b>100</b>	Question No.- is compulsory
<b>K4,K5</b>	<b>C-3/5X20 marks</b>	<b>1500</b>	<b>60</b>		

**COURSE PROFILE**  
**II YEAR - THIRD SEMESTER**  
**TOTAL CREDITS -22**

COURSE CODE	COURSE TITLE	CREDITS	HRS/ WK	TOTAL HOURS	L-T-P	CA	SE	TOTAL
10SP18/3C/CGP	CorePaper-VI Cell Biology, Genetics and Plant Breeding	4	5	75	3-2-0	40	60	100
10SP18/3C/PMB	CorePaper-VII Plant Molecular Biology	4	4	60	3-2-0	40	60	100
10SP18/3C/PBI	CorePaper-VIII Plant Biotechnology	4	4	60	3-1-0	40	60	100
10SP18/4C/PR3	Practical – III**: Covering Core Papers VI, VII & VIII	-	8	120	0-0-8	-	-	-
10SP18/3E4/BIS (or) 10SP18/3E4/WOT	Elective-IV Biostatistics (or) Wood technology	3	3	45	2-1-0	40	60	100
10SP18/3E/MBD	Extra Disciplinary – II Medicinal Botany and Dietetics (offered to other Department students)	3	4	60	3-0-0	40	60	100
10SP18/3I/INT	Internship*	2	-	-	-	-	-	100
10SP18/3S/CBR	Soft skill-III Computing for Biological Research	2	2	30	-	-	50	50

**\*A minimum of fifteen days internship programme to be carried out in recognized institution during the II Semester vacational holidays.**

**\*\* Core practical will be conducted at the end of the year.**

### SEMESTER-III

### CORE PAPER- VIII

### CELL BIOLOGY GENETICS AND PLANT BREEDING

**COURSE CODE-10SP18/3C/CGP**

Teaching hours: 5 / Week

Credits: 4

75/ Semester

L-T- P

3- 2- 0

### **COURSE OBJECTIVES:**

To enable the students to

1. Expose to plant cell organelles and their functions.
2. Be aware of the oncogenes and tumour cells.
3. Learn about cell signaling mechanism.
4. Understand basic concepts of genetics.
5. Impart knowledge about plant breeding techniques.

### **COURSE OUTLINE:**

#### **UNIT I**

**(15Hrs)**

Membrane structure and function, Structure of model membrane, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Structural organization and function of intracellular organelles cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes and chloroplast, Endosymbiont theory, Structure & function of cytoskeleton and its role in motility.

#### **UNIT II**

**(15Hrs)**

##### **Cell division and cell cycle:**

Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle. Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, apoptosis, therapeutic interventions of uncontrolled cell growth.

Chromosomes - morphology, fine structure - telomere-types: lamp brush, polytene, isochromosomes - heterochromatin and euchromatin, chromosome identification - banding techniques - chromosomal aberrations, transposons.

#### **Unit- III**

**(15Hrs)**



### Cell signaling:

Hormones and their receptors, cell surface receptor, signaling through G- Protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, light signaling in plants, bacterial chemotaxis and quorum sensing.

### Microbial Genetics:

Methods of Genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating.

## Unit – IV

(15Hrs)

Mendelian principles: Dominance, segregation, independent assortment. Concept of Gene : Allele, multiple alleles, pseudoallele, Extensions of Mendelian principles : Co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting. Linkage and crossing over, sex linkage and sex influenced characters. Gene mapping methods: Linkage maps, tetrad analysis mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

## UNIT – V

(15Hrs)

Extra chromosomal inheritance: Inheritance of mitochondrial and chloroplast genes, maternal inheritance. Human genetics: Pedigree analysis, lod score for linkage testing, Karyotypes, genetic disorders. Quantitative genetics: Polygenic inheritance, heritability and its measurements.

Plant breeding: Methods of crop improvement – selection (pure line, mass and clonal), hybridization – pedigree, bulk, backcross. Multilines, multilineal hybrids, heterosis – types, causes, mutation breeding and disease resistance, crop improvement and seed certification.

### RECOMMENDED TEXT BOOKS

1. Chaudhry R.K. A text Book of Plant Breeding.
2. Rangaswami.R.A. A Text book of Agricultural Statistics., 1995.
3. Shukla, R.S. and Chandel P.S. Cytogenetics, Evolution and Plant Breeding , 2004.
4. Satyesh Chandra Roy, Kalyan Kumar De, Cell Biology, New Central Book Agency Pvt. Ltd. 2014.
5. Verma P.S.A and V.K. Agarwal. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S.Chand & Co. Pvt. Ltd., 2014.

### REFERENCE BOOKS

1. Darlington, C.D.: Recent Advances in Cytology, Blarkstains Sons & Co.
2. DeRobertis, E.D.P. and De Robertis, E.M.F. 2001. Cell and Molecular Biology, Lippineott Williams & Wilkins, Bombay.



3. Sharma, A.K. and Sharma, A. 1980. Chromosome Techniques. Theory and Practice, Butterworth.
4. Levin B. 2015. Genes XI
5. Stansfield, W.D. 1969. Theory and problems of Genetics.
6. Sinnott, E.W. Dunn, L.E. and Dobzhansky, T. 1973. Principles of Genetics.
7. Winter, P.C., Hickey, G.I. and Fletcher, H.L., Genetics, Viva Books 2002

## JOURNALS

1. Journal of Cytology
2. Journal of Genetics

## E-LEARNING RESOURCES

1. <http://www.cellsignal.com/contents/science/cst-pathways/science-pathways>
2. [https://www.researchgate.net/publication/10799605\\_Cell\\_Division](https://www.researchgate.net/publication/10799605_Cell_Division)
3. [https://mcb.berkeley.edu/courses/mcb110spring/nogales/mcb110\\_s2008\\_4signaling.pdf](https://mcb.berkeley.edu/courses/mcb110spring/nogales/mcb110_s2008_4signaling.pdf)
4. [https://www.researchgate.net/publication/289980213\\_Lecture\\_notes\\_Principles\\_of\\_Genetics](https://www.researchgate.net/publication/289980213_Lecture_notes_Principles_of_Genetics)
5. [https://www.researchgate.net/publication/263162927\\_Plant\\_Breeding](https://www.researchgate.net/publication/263162927_Plant_Breeding)

## COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Outline the structural organization and function of cell organelles	K2, K4
CO 2	Explain about cell cycle and tumour cells	K4
CO 3	Discuss about cell signaling mechanism	K4
CO 4	Analyse general concepts in genetics, linkage and crossing over, extra chromosomal inheritance and polygenic inheritance	K2, K4
CO 5	Evaluate plant breeding techniques and apply for crop improvement	K3, K4

## Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	1	1	3	3
CO 2	3	1	1	3	3

<b>CO 3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>3</b>	<b>1.6</b>	<b>1.8</b>	<b>3</b>	<b>3</b>

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD)

E Content, Videos-

Problem Solving-Group Discussion-

Quiz-Seminar-

Peer Learning.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI- 600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER- VIII**

**CELL BIOLOGY GENETICS AND PLANT BREEDING**

**COURSE CODE-10SP18/3C/CGP**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		

<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		
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### **CORE PAPER-IX**

#### **PLANT MOLECULAR BIOLOGY**

**COURSE**      **CODE-10SP18/3C/**  
**PMB**

**Teaching hours: 4 / Week**

**Credits: 4**

**60/ Semester**

**L-T- P**

**3- 1- 0**

#### **COURSE OBJECTIVES:**

To enable the students to

1. Understand the molecular aspects of Nucleic acids.
2. Obtain knowledge on techniques and applications of DNA.
3. Gain knowledge on synthesis and processing o protein.
4. Be aware of the enzymes of transcription and different classes of RNA.
5. Be familiar with gene regulation concepts.

#### **COURSE OUTLINE:**

**UNIT- I**

**(10Hrs)**

Nucleic acids - Base pairing and variations in base composition. Types and forms of DNA. Chargaff's rule - DNA size - fragility - melting curves - denaturation - renaturation - circular and superhelical DNA - topoisomerase - special base - Repeated sequence - DNA sequencing

## UNIT II

(10Hrs)

DNA replication - basic rule of replication – DNA replication in prokaryotes – enzymology- DNA topoisomerase - DNA polymerase - ligase, helicase Termination of DNA replication - Replication of eukaryotic chromosomes- Eukaryotic DNA polymerase- DNA repair mechanism- DNA methylation- DNA gyrase.

## UNIT- III

(15Hrs)

Transcription - Enzymology - RNA polymerase - classes of RNA molecules - transcription in Prokaryotes and Eukaryotes - splicing mechanisms - Reverse transcriptions. Inhibitors of nucleic acid biosynthesis.

## UNIT- IV

(15Hrs)

Protein synthesis and processing : (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA – identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post-translational modification of proteins). Genetic code – characters – codons and anticodons – wobble hypothesis.

## UNIT V

(10Hrs)

Gene regulation - Operon concept - Lac repressor - c-AMP, Catabolic repression - *ara* operon and *trp* operons - Gene expression in eukaryotes. Role of chromatin in gene expression and gene silencing.

## RECOMMENDED BOOKS

1. David Friefielder. Molecular Biology. Narosa Publishers House, 1987.Delhi, 2007.
2. Dubey R.C. Advanced biotechnology, S.Chand & Co., Ltd., New Delhi, 2014.
3. GeralKarp. Cell andMolecular biology 6<sup>th</sup> (Ed).2009.
4. Ignacimuthu S. 2015. Basic Bio-technology, Tata Mc Graw Hill, Publishing Co., Ltd., New
5. Kumar H.D. A text book of Biotechnology, East West Affiliated Press Ltd., New Delhi,1993.
6. P.K.Gupta. Molecular biology and Genetic Engineering. 2008.Rastogi pub , New Delhi.

7. Veer Bala Rastogi. Fundamentals of molecular biology. revised 2010. Ane books pub.
8. Verma P.S.A and V.K. Agarwal. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S.Chand & Co. Pvt. Ltd., 2004.

#### REFERENCE BOOKS

1. Alberts, B., Bray, D., Lewis, J. Raff, M., Roberts, K. and Watson, J.D. 1989. Molecular Biology of the cell, Garland Publishing Inc., New York.
2. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology, W.H. Freeman and Co., New York, USA.
3. Richard, M., Twyman and Wisden, W. 1999. Advanced Molecular Biology, Viva Books Pvt. Ltd.
4. Turner, P.C., Mclenann, A.G., Bates, A.D. and White, M.R.H. 2001. Instant notes on molecular biology.
5. Snustad Peter, D. Michael J. Simmons. Principles of Genetics, John Wiley Sons.
6. Robert H. Tamarin. Principles of Genetics, Tata McGraw Hill Company.
7. Benjamin Lewin . Genes VIII, Prentice Hall.

#### JOURNALS

1. Plant Cell Biotechnology and Molecular Biology
2. Journal of Plant Biotechnology

#### E-LEARNING RESOURCE

1. [https://www.researchgate.net/publication/329323298\\_DNA\\_Replication](https://www.researchgate.net/publication/329323298_DNA_Replication)
2. <http://www.bx.psu.edu/~ross/workmg/Replication1Ch5.pdf>
3. [http://biology.kenyon.edu/courses/biol63/watson\\_06.pdf](http://biology.kenyon.edu/courses/biol63/watson_06.pdf)
4. <https://www.csun.edu/~cmalone/pdf360/Ch20-1%20euk%20gene%20reg.pdf>
5. <https://www.crc.uga.edu/~rcarlson/bcmb3100/Chap40.pdf>

#### COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Analysis of DNA and sequencing	K4
CO 2	Discuss replication and repair mechanism in DNA	K4
CO 3	Explain about transcription mechanism and classes of RNA	K4
CO 4	Evaluate protein synthesis and processing mechanisms	K4, K5
CO 5	Outline gene regulation and expression in prokaryotes and eukaryotes	K4

#### Mapping of CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	1	3	3
CO 2	3	3	1	3	3
CO 3	3	2	1	3	3
CO 4	2	2	1	3	3
CO 5	2	2	1	3	3

<b>Average</b>	<b>2.6</b>	<b>2.4</b>	<b>1</b>	<b>3</b>	<b>3</b>
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**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning.

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**CORE PAPER-IX**

**PLANT MOLECULAR BIOLOGY**

**COURSE CODE-10SP18/3C/ PMB**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**CORE PAPER-X**  
**PLANT BIOTECHNOLOGY**

**COURSE**  
**10SP18/3C/PBI**                      **CODE-**

**Teaching hours: 4 / Week**

**Credits: 4**

**60/ Semester**

**L-T- P**

**3- 1- 0**

**COURSE OBJECTIVES**

To enable the students to

1. Understand the fundamentals of various recombinant technology.
2. Study the rules and regulations for GM foods.
3. Develop skills to propagate plants *invitro*.
4. Impart the knowledge on applications of recombinant technology and tissue culture.
5. Study the applications of *invitro* techniques.

**COURSE OUTLINE:**

**UNIT – I**

**(15Hrs)**

**Recombinant DNA technology** – Tools of recombinant DNA: restriction endonucleases and other enzymes; vectors - plasmid – pBR322, pUC18, Ti plasmid, bacteriophage – M13, lambda phage, phagemids, cosmids – pLFR5, pJB8, BAC and YAC Vectors - choice of vectors - gene cloning principles and techniques- construction of genomics, cDNA libraries.

**Herbicide resistance** – resistance against glyphosate, resistance against pests and insects – ***Bacillus thuringiensis*** – Bt genes endotoxins.

**UNIT – II**

**(10Hrs)**



Regulation and release of Genetically modified organism in India- Recombinant DNA guidelines, Regulation of GM food – Status of development of GM food in India. IPR, PGR – importance.

### UNIT- III

(15Hrs)

Laboratory Organisation – Design of different laboratories and management. Methodologies – Aseptic techniques – methods of sterilization – basic procedure for Aseptic transfer – Incubation of culture – Composition of Culture Media – MS Medium – B5 Medium.

General Techniques of Micropropagation, Initiation of Culture, Multiplication, Rooting, Hardening. Callus Culture – establishment – Organisation – Embryogenesis. Somaclonal & Gametoclonal variation, Uses in crop improvement.

### UNIT – IV

(10Hrs)

Shoot TIP / Meristem Culture for Virus free plants – Chemotherapy – Thermootherapy – Virus indexing. Anther culture – Production of Haploids – Utilization of Haploids in Agriculture. Protoplast Culture – Protoplast isolation, purification, viability test – culture – regeneration. Somatic Hybridization – Protoplast fusion techniques – Chemical fusion – Electrofusion selection of fusion products. Synthetic Seeds – Practical applications. Cryopreservation & gene bank.

### UNIT – V

(10Hrs)

Approaches and factors affecting the production of secondary metabolites, production of pharmaceutically important drugs – alkaloids – food additives and insecticides in *in vitro* system. Application of Tissue Culture – Techniques in Agriculture, Horticulture & Forestry.

### RECOMMENDED TEXT BOOKS

1. Bhojwani, S.S. and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice revised edition. Elsevier Science Publishers, New York, USA.
2. Bojwani, S.S. 1990. Plant Tissue Culture: Applications and Limitations, Elsevier Science Publisher, New York, USA.
3. Dubey R.C. Advanced biotechnology, S.Chand & Co., Ltd., New Delhi, 2014.
4. Khasim, S.M. 2002. Botanical Microtechnique: Principles and Practice, Capital Publishing Company, New Delhi.
5. Kumar H.D. A text book of Biotechnology, East West Affiliated Press Ltd., New Delhi, 1993.

### REFERENCE BOOKS

1. Trigiano, R.N., and D.J. Gray (eds.). 2000. Plant tissue culture concepts and laboratory exercises. CRC Press. (Textbook). 2nd Edition.
2. Kyte, M., and Kleyn, J. 1996. Plant from test tubes. Timber Press. Auge, R. et al., 1995. In vitro culture and its applications in horticulture. Science Publishers, Inc.



3. Crispeels, M.J. and D. E. Sadava. 2003. Plants, genes and agriculture. Jones and Bartlett Publishers.
4. Gamborg, O.L. and G. C. Phillips (eds). 1995. Plant cell, tissue and organ culture. Springer Lab Manual.
5. Potrykus, I, and G. Spangenberg (eds.). 1995. Gene transfer to plants. Springer Lab Manual.
6. Jones, H. 1996. Plant gene transfer and expression protocols. Methods in molecular biology . 49. Humana Press.
7. Collins, H.A. and Edwards, S. 1998. Plant Cell Culture, Bios Scientific Publishers, Oxford, UK.
8. Hall, R.D. (Ed.) 1999. Plant Tissue Culture: Techniques and Experiments, Academic Press, New York.

## JOURNAL

Journal of molecular Biology ,

Journal of Plant Cell, Tissue and Organ Culture

## E- LEARNING RESOURCES

- 1.<https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/tissue-culture>
- 2.<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/molecular-biology>
- 3.[https://www.researchgate.net/publication/295296782\\_Cell\\_and\\_Molecular\\_Biology](https://www.researchgate.net/publication/295296782_Cell_and_Molecular_Biology)
- 4.[https://www.researchgate.net/publication/51881407\\_Intellectual\\_property\\_rights\\_An\\_overview\\_and\\_implications\\_in\\_pharmaceutical\\_industry](https://www.researchgate.net/publication/51881407_Intellectual_property_rights_An_overview_and_implications_in_pharmaceutical_industry)
- 5.<https://www.microscopemaster.com/tissue-culture.html>

## COURSE OUTCOMES

CO.No.	CO Statement	Knowledge Level
CO 1	Design the tools and techniques of recombinant technology	K3,K4
CO 2	Explain the regulations, status and rights for the GM food.	K4
CO 3	Outline the basics of tissue culture laboratory, its needs and the steps involved in micropropagations.	K4, K5
CO 4	Discuss the tissue culture techniques and its applications.	K4,K5
CO 5	Analyse the product production by using invitro technique	K5

### Mapping of CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	2	3	3	3
CO 2	1	2	1	3	3
CO 3	1	3	3	3	3
CO 4	1	3	2	3	3
CO 5	1	2	2	3	3
Average	1	2.4	2.2	3	3

### TEACHING METHODOLOGY:

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning.

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**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER-X**

**PLANT BIOTECHNOLOGY**

**COURSE CODE-10SP18/3C/PBI**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	Question No.- is compulsory
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

## **PRACTICAL III : COVERING CORE PAPERS VI, VII and VIII**

**COURSE CODE-10SP18/4C/PR3**

**Teaching hours: 8/ Week**

**Credits: 4**

**120/ Semester**

**L-T- P**

**0-0- 8**

### **COURSE OBJECTIVES:**

To enable the students to

1. Study the cell organelles of the plant cell.
2. Understand the different stages of cell division.
3. Find out the statistical significance of plant sample data.
4. Perceive knowledge on molecular techniques.
5. Impart skill on micropropagation techniques.

### **COURSE OUTLINE:**

#### **CELL BIOLOGY**

1. Study of dividing cells – squash
2. Calculate the mitotic index of onion root tip cells
3. Smear techniques
4. Study of induced aberrations in onion root tips employing chemicals and plant extracts.
5. Calculation of aberration percentage of chemical treated onion root tip cells
6. Induction of polyploidy using colchicines
7. Study of sub cellular organelles from electron micrographs
8. Nuclear stains
9. Pre fixatives
10. Demonstration of Salivary gland chromosomes

#### **GENETICS**

11. Genetics problem based on the theory
12. Chromosome mapping
13. Calculation of variation pattern in fruits/leaves/ seeds - standard deviation standard error – Based on the data given.
14. Chi square test
15. Students “t” Test

#### **PLANT MOLECULAR BIOLOGY**

16. Isolation of Genomic DNA
17. Isolation of RNA

18. Electrophoresis of nucleic acids (know protocols)
19. Preparation of competent *E. Coli* cells
20. Isolation of plasmid DNA
21. Restriction analysis of DNA
22. Southern blotting
23. RFLP techniques
24. PCR techniques

Cot curve, DNA melting curve, tertiary structure of protein, tRNA, PCR flow chart, SDS, Southern blotting, X-ray diffraction protein DNA, Ethidium bromide, Lac Operon. Simple problems based on the theory syllabus.

### PLANT BIOTECHNOLOGY

25. Tissue culture laboratory design
26. Sterilization
27. Inoculation of explant
28. Media preparation
29. Callus Culture
30. Organ Culture
31. Plant regeneration- Anther culture
32. Synthetic Seed Preparation.

Recognition site for Hind III, Eco RI, Bam H1, PUC Plasmid.

Industrial/ Research Centre visit for at least 2-3 days.

**Bonafide record of practical work done should be submitted for the practical examination.**

### COURSE OUTCOMES

CO No.	CO Statement
CO 1	Compare the cell organelles and their functions of a plant cell
CO 2	Analyze the chromosomal aberrations induced by chemicals
CO 3	Apply the statistical methods for various plant population studies
CO 4	Utilize the nucleic acid isolation technique for advanced molecular studies
CO 5	Demonstrate micropropagation of medicinally important plants

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

M. Sc. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY

PRACTICAL EXAMINATION

TITLE OF THE PAPER: PRACTICAL –III

Max Marks- 100

PAPER CODE: 10SP18/4C/PR3

Practical- 85

**Record- 10**

**Viva-voce- 5**

**Time- 4 hrs**

1. Make a suitable squash preparation of **A**. Display any two stages of cell division. Draw labeled sketches and identify giving reason.  
(10)
2. Make a suitable squash preparation of **B** and show any one chromosomal aberration and draw diagram.  
(4)
3. Make a suitable smear preparation of **C** and show any one stage of cell division. Draw diagram and identify giving reason. (6)
4. Solve the genetics problems **D1** and **D2**. (4+4=8)
5. Write the protocol of the experiment **E** provided to you. (4)
6. From the given plant material **F**, find the mean and calculate the standard deviation with reference to length of the sample.  
(6)
7. Estimate the amount of DNA in the given sample **G**. (6)
8. Solve the Molecular biology problem **H1** and **H2**. (4 +4= 8)
9. Prepare and Inoculate the given explant **I**, provided to you and write the protocol for the experiment and submit the preparation. (8)
10. Prepare synthetic seeds of given sample **J** by immobilization method. (5)
11. Solve the tissue culture problem – **K**. (4)
12. Identify and comment on **L, M, N** and **O**. (4x4= 16)

#### **ELECTIVE- IV BIOSTATISTICS**

**COURSE CODE-10SP18/3E4/BIS**

**Teaching hours: 3 / Week**

**Credits: 3**

**45/ Semester**

**L-T- P**

**2- 1- 0**

## **COURSE OBJECTIVES:**

To enable the students to

1. Impart knowledge about basic principles of biostatistics.
2. Understand fundamental concept of probability.
3. Acquire knowledge test of hypothesis in biostatistics.
4. Know the concept of sampling methods and analysis of biological data.
5. Enlighten about computer applications in biology.

## **COURSE OUTLINE:**

### **UNIT - I**

**(7Hrs)**

Introduction to Biostatistics, sample collection and representation of Data - Primary and Secondary - Classification and tabulation of Data – Diagrams, graphs and presentation.

### **UNIT – II**

**(8Hrs)**

Analysis of quantitative characters and Measures of central tendency of mean, median, mode. Measures of dispersion – types, standard deviation and standard error, ANOVA.

### **UNIT - III**

**(10Hrs)**

Probability; basic principles - types - Rules of probability - addition and multiplication rules.

Patterns of probability distribution; binomial - Poisson and normal - Tests of significance; Chi - square test for goodness of Fit; Null hypothesis, level of Significance - Degrees of Freedom.

### **UNIT – IV**

**(10Hrs)**

Student's - distribution; "t" test - Estimation of population parameters based on small sample statistics - Comparison of sample mean with population mean - comparison means of two small sample of equal and unequal sizes. - Correlation - types of correlation - methods of study of correlation - testing the significance of the coefficients of correlation - Regression and types.

### **UNIT – V**

**(10Hrs)**

Computer application in Biology - Computer memory and storage devices - Operating systems and application programmes - MS excel and statistical functions - ANOVA. Basic introduction to Multivariate Analysis of Variance (M ANOVA).

## **RECOMMENDED BOOKS**

1. Gurumani, N. (2005) Biostatistics, 2<sup>nd</sup> edn. MJP publications, India.

- Pillai, R.S.N. and Bagawathi, V. (1989), Statistics. Theory and practice (For B.Com. and B.A. (Eco) classes) S.Chand & Co. Ltd. New Delhi.
- Pillai, R.S.N. and Bagawathi, V. (1987) Practical Statistics (For B.Com. and B.A., Students) S.Chand & Co. (Pvt.) Ltd., New York.
- Mahajan, B.K. (1984). Methods in Biostatistics for Medical students and Research works. Smt. Indu Mahajan, New Delhi.

#### REFERENCE BOOKS

- Milton, J.s. (1992) Statistical method in Biological and Health Sciences. McGraw Hill Inc., New York.
- Schefler, W.C. (1968) Statistics for biological sciences, Addison- Wesley Publication Co., London.
- Snedecor, G.W and Cochran, W.G. (1967) Statistical Methods. Oxford & IBH Publication co., New Delhi.
- Spiegel, M.R. (1981) Theory and Problems of statistics, Schaum's Outline series McGraw-Hill International Book Co., Singapore.
- Stansfield, W.D. (1986) Theory and problems of genetics (including 600 problems). Schaum's outline series. McGraw Hill ) Book Co. New York.
- Sobel, R.R. and Rohlf, F.J. (1969) Biometry. The principles and Practice and Statistics in Biological Research. W.H. Freeman and Co., San Francisco.

#### JOURNAL REFERENCES

- Journal in Critical Reviews in Analytical Chemistry
- AKCE International Journal of Graphs and Combinatorics

#### E LEARNING RESOURCES:

- <http://www.math.louisville.edu/~pksaho01/teaching/Math662TB-09S.pdf>
- <http://www.sjsu.edu/faculty/gerstman/StatPrimer/probability.pdf>
- [https://stats.libretexts.org/Bookshelves/Biostatistics/Book%3A\\_Natural\\_Resources\\_Biometrics\\_\(Kiernan\)/1%3A\\_Descriptive\\_Statistics\\_and\\_the\\_Normal\\_Distribution/1.2ProbabilityDistribution](https://stats.libretexts.org/Bookshelves/Biostatistics/Book%3A_Natural_Resources_Biometrics_(Kiernan)/1%3A_Descriptive_Statistics_and_the_Normal_Distribution/1.2ProbabilityDistribution)
- <https://www.statisticshowto.datasciencecentral.com/probability-and-statistics/t-test/>
- <https://www.ruf.rice.edu/~bioslabs/tools/stats/ttest.html>

#### COURSE OUTCOMES

CO No.	CO Statement	Knowledge Level
CO 1	Discuss the fundamental concept of biostatistics, sampling techniques, diagrammatic and graphical representation	K3
CO 2	Analyse data using measures of central tendency and measures of dispersion	K4
CO 3	Apply the fundamentals of probability and its distribution and statistical hypothesis test	K3,K4



<b>CO 4</b>	Evaluate student 't' test , correlation , regression and testing its significance	K4, K5
<b>CO 5</b>	Use computer application in biology and imbibe computer skills for biological data analysis and graphical representation	K5

### Mapping of CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

### TEACHING METHODOLOGY:

Lecture (Chalk and Talk-OHP-LCD),  
 E Content, Videos,  
 Problem Solving-Group Discussion,  
 Quiz-Seminar,  
 Peer Learning.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)  
 CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE- IV BIOSTATISTICS**

**COURSE CODE-10SP18/3E4/BIS**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

### ELECTIVE- IV WOOD TECHNOLOGY

**COURSE**  
**10SP18/3E4/WOT**

**CODE-**

**Teaching hours: 3 / Week**

**Credits: 3**

**45/ Semester**

**L-T- P**

**2- 1- 0**

**COURSE OBJECTIVES:**

To enable the students to

1. Gain knowledge on wood formation.
2. Understand the properties of wood.
3. Study the mechanical properties and factors affecting wood formation.

4. Learn chemical properties.
5. Explore the uses of wood.

### **COURSE OUTLINE:**

#### **Unit – I (10 Hrs)**

**wood formation** – role of hormones, water, internal and external factors - Growth rings- Heart wood and sap wood, juvenile and reaction wood.- Vessels- length, shape, lateral wall pittings, perforations, intervessel pits, tyloses, Tracheids, size and wall characteristics- rays- classification and types

#### **Unit – II (10 Hrs)**

**Density and specific gravity of the wood** – significance- Calculation of moisture content and specific heat of wood- Principles of wood preservation- Preservatives- Process of preservation (pressure and non pressure methods)- Seasoning of wood.

#### **Unit – III (7 Hrs)**

**Mechanical properties of wood**-tensile strength-compression strength- shearing strength-bending strength- stiffness-shock resisting capacity- hardness. Factors affecting mechanical properties of wood.

#### **Unit – IV (8 Hrs)**

**Chemical properties of wood**- Cellulose- hemicellulose-, lignin, mineral matter- essential oil, tannins, resins, gums, eco-friendly dyes from bark and wood.

#### **Unit – V (10 Hrs)**

**Wood products**- Timber, rail road ties, veneer plywood- furniture, wood fuel- lead pencils- matches, tooth picks- paper pulp-filaments and yarn cellulose- gums, resins, turpentine- resins barks, tannins and dyes.

### **REFERENCES**

1. Bailey, I. W. 1954 Contribution to plant Anatomy. Chronica Botanica Waltham Mass
2. Brown, H. P Text Book of Wood Technology Vol –I McGraw Hill Book Co. New York
3. Gamble, J. S. Manual of Indian Timbers London
4. Pearson, R. S. Commercial Timbers of India Govt of India Publications
5. Metcalfe, C. R. 1962. Anatomy of Dicotyledons Vol 2 Claredon Press London

<b>CO.No.</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO 1</b>	Analyse the formation of wood	K4
<b>CO 2</b>	Discuss the properties of wood	K3
<b>CO 3</b>	Explain the mechanical properties and factors affecting wood formation	K3, K4
<b>CO 4</b>	Outline the chemical properties of wood	K3
<b>CO 5</b>	Evaluate the economic importance of wood	K5

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**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE- IV WOOD TECHNOLOGY**

**COURSE CODE-10SP18/3E4/WOT**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>		<b>Question No.- is</b>

<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>	<b>100</b>	compulsory
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**EXTRA DISCIPLINARY-II**

**MEDICINAL BOTANY AND DIETETICS**  
(offered to other Department students)

**COURSE**

**CODE-**

**10SP18/3E/MBD**

**Teaching hours: 4/ Week**

**Credits: 3**

**60/ Semester**

**L-T- P**

**3- 1- 0**

**COURSE OBJECTIVES:**

To enable the students to

1. Explore the field of medicinal plants
2. Understand the scope and importance of Pharmacognosy.
3. Know the specific plant taxa used in traditional medicine.
4. Understand the therapeutic value of plant products
5. learn the applications of plant chemical constituents on human health

## COURSE OUTLINE:

### UNIT – I

(10Hrs)

**Biological source**, geographical distribution, physico-chemical analysis of the following medicinal plants: *Tinospora cordifolia* (root), *Acorus calamus* (rhizome), *Costus* (leaf), *Terminalia chebula* (fruit), *Plantago ovata* (seed), *Holarrhena antidysenterica* (bark),

### UNIT - II

(8Hrs)

**Uses of essential oils** (Sandal wood, Eucalyptus and Citronella), fatty oil (Sesame, Sunflower and Coconut), vegetable fat (Vanaspathi and Peanut butter).

### UNIT - III

(7Hrs)

**Therapeutic value** of Indian plant foods- Rice, Wheat, Green gram, Black gram, Millets, Lemon, Banana, Ginger, Turmeric, Coriander, Garlic, Asafoetida, Cumin and Clove. Allergic responses of plants- Brinjal, Colocasia & Mushrooms.

### UNIT - IV

(10Hrs)

**Plants in the treatment of diseases**- anorexia, arthritis, constipation, diarrhea, diabetics, psoriasis, hyper tension, memory loss.

### UNIT - V

(10Hrs)

**Anti-oxidants, PUFA, probiotics, prebiotics dietary fibres, omega-III fatty acids.** **Cosmeceuticals:** Introduction, retinoic acid, alpha hydroxyl acid, boswellic acid, vitamins C and E, Coenzyme Q-10 (Ubiquinone) miscellaneous; tetra hydro curcuminoids.

## RECOMMENDED TEXT BOOKS

1. Pharmacognosy, C.K Kokate, A.P Purohit& S.B Gokhale (2009), Nirali Prakashan, 4<sup>th</sup> Ed.
2. H.K.Bhakru .Herbs that heal. 2008. Orient publication.
3. Dr B.P. Pandey (2014) Economic Botany, Published by S. Chand & Company Ltd,

## REFERENCE BOOKS

1. Natural products in medicine: A biosynthetic approach (1997). Wiley.
2. Hornok, L .(ed.) (1992). Cultivation and processing of medicinal plants, Chichister, U. K; J.Wiley and sons.
3. Trease and Evans, Pharmacognosy – William Charles Evans, 14<sup>th</sup> ed. (2002) , Harcourt Brace and Company.
4. Sukh Dev (2006 ) Prime Ayurvedic Plant Drugs , Anshan publication.

## JOURNALS:

Medicinal and Aromatic Plants

International Journal of Medicinal Plants

## E LEARNING RESOURCES:

1. [www.gamlaa.com/categories/Medicinal-Plants](http://www.gamlaa.com/categories/Medicinal-Plants)
2. <http://www.ecornell.com/certificates/plant-based-nutrition/certificate-in-plant-based-nutrition/>
3. <http://carlg.org/englakandeorter.html>
4. <https://www.urmc.rochester.edu/encyclopedia/content.aspx?contenttypeid=1&contentid=1169>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5132387/>

## COURSE OUTCOMES

CO.No.	CO Statement	Knowledge Level
CO 1	Analyse the physicochemical analysis of medicinal plants	K4,K5
CO 2	Apply the knowledge gained on botanical resources for its varied uses	K3,K4
CO 3	Discuss on the therapeutic value of Indian foods	K4, K5
CO 4	Utilize plants in treatment of various diseases	K4, K5
CO 5	Design a proper food to maintain proper health	K 5

## MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	1	1	3	3
CO 2	3	1	1	3	3
CO 3	3	1	1	3	3
CO 4	3	1	1	3	3
CO 5	3	1	1	3	3

<b>Average</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>
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**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

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**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**EXTRA DISCIPLINARY-II**

**MEDICINAL BOTANY AND DIETETICS (offered to other Department students)**

**COURSE CODE-10SP18/3E/MBD**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K3</b>	<b>A-5/8X8 marks</b>	<b>500</b>	<b>40</b>	<b>100</b>	Question No.- is compulsory
<b>K4,K5</b>	<b>B-3/5X20 marks</b>	<b>1500</b>	<b>60</b>		



**SOFT SKILL - III**  
**COMPUTING FOR BIOLOGICAL RESEARCH**

	<b>COURSE</b>	<b>CODE-</b>
<b>Teaching hours: 2/ Week</b>	<b>10SP15/3S/CBR</b>	
<b>30/ Semester</b>	<b>Credits: 2</b>	
	<b>L-T- P</b>	
	<b>2- 0- 0</b>	
<b>UNIT – I</b>		<b>(6 Hrs)</b>
<b>Introduction to Word</b> - Editing a document – Finding and Replacing Text – Inserting symbols- Using Thesaurus – Enhancing document – Columns, Tables and other features.		
<b>UNIT – II</b>		<b>(6 Hrs)</b>
<b>Introduction to Work sheet</b> – Editing cell & using Commands and functions - Formatting a work sheet – Printing work sheet.		
<b>UNIT – III</b>		<b>(6 Hrs)</b>
<b>Creating charts</b> – Naming ranges and using statistical, mathematical functions, database in a work sheet – Additional formatting commands and drawing toolbar – Miscellaneous commands and functions.		
<b>UNIT – IV</b>		<b>(6 Hrs)</b>
<b>Overview of power</b> point using the visual aids, presentation for research projects, Computer viruses, Introduction to Internet – Web features.		
<b>UNIT-V</b>		<b>(6 Hrs)</b>
<b>Biological Databases</b> – SRS - Pub Med – NCBI – EMBL-EBI – GenBank – DDBJ - UniProt/SwissProt - TrEMBL- PIR- PDB – MMDB – SCOP - CATH.		

## REFERENCE BOOKS

1. PC Software for Windows 98' made simple – R.K. Taxali – Tata McGraw Hill Publishers, 2005.
2. Sundaralingam. R, Kumaresan. V, (2012).Bioinformatics, Saras Publication,
3. Ignacimuthu . S ( 2013) Basic Bioinformatics Alpha Science International Limited,
4. Computer Literacy BASICS: Microsoft Office 2007 Companion.

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### **M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**SOFT SKILL - III**

**COMPUTING FOR BIOLOGICAL RESEARCH**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2	A-5/5X2 marks	50	10	50	Question No.- is compulsory
K 3	B-4/6X5marks	250	20		
K4,K5	C-1/2X20marks	1500	20		

**COURSE PROFILE**  
**II YEAR - FOURTH SEMESTER**  
**TOTAL CREDITS -25**

COURSE CODE	COURSE TITLE	CREDITS	HRS/ WK	TOTAL HOURS	L-T-P	CA	SE	TOTAL
10SP18/4C/PPH	Core Paper-IX Plant Physiology	4	5	75	3-2-0	40	60	100
10SP18/4C/PBB	Core Paper-X Plant Biochemistry and Biophysics	4	6	90	3-3-0	40	60	100
10SP18/4C/PR3	Practical - III: Covering Core Papers VI, VII and VIII	4	-	-	-	40	60	100
10SP18/4C/PR4	Practical - IV: Covering Core Papers IX and X	4	8	120	0-0-8	40	60	100
10SP18/4C/PRO	Research Project	4	5	75	0-0-5	40	60	100
10SP18/4E5/BME (or) 10SP18/4E5/NBT	Elective-V Bioinstrumentation and Methodology (or) Nanobiotechnology	3	4	60	2-2-0	40	60	100
10SP18/4S/BIN	Soft skill-IV Bioinformatics	2	2	30	-	-	50	50

## SEMESTER – IV

### CORE PAPER –XII PLANT PHYSIOLOGY

COURSE CODE-10SP18/4C/ PPH

Teaching hours: 5 / Week

Credits: 4

75/ Semester

L-T- P

3- 2- 0

#### COURSE OBJECTIVES:

To enable the students to

1. Integrate plant physiological knowledge to understand plant's functioning.
2. Acquire knowledge on biochemical and physiological processes during plant growth and development.
3. Understand the importance of mineral nutrients in plant functions.
4. Impart knowledge on phytohormones and their role in plant functioning
5. Study plant response to various environmental conditions.

#### COURSE OUTLINE:

##### UNIT - I

(15Hrs)

Water relation in plants – properties of water, water potential, mechanism of water absorption – active – passive transport, apoplast & symplast concept. Solute transport and photo assimilate translocation – uptake, transport and translocation of ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; stomatal mechanism- anti transparent – ascent of sap

##### UNIT - II

(15Hrs)

Photosynthesis – Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO<sub>2</sub> fixation – C<sub>3</sub>, C<sub>4</sub> and CAM pathways. Respiration and photorespiration - Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

##### UNIT – III

(15Hrs)

**Mineral nutrients** – Role of Macro and Micro nutrients, Nitrogen cycle and fixation, **Nitrogen metabolism** – Nitrogen and ammonium assimilation; amino acid biosynthesis. **Secondary metabolites** – Biosynthesis of terpenes, phenols and alkaloids and their roles.

#### **UNIT - IV**

**(15Hrs)**

**Plant hormones** – Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action of auxins, gibberellins, cytokinins and abscisic acid. Sensory photobiology – structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; photoperiodism, biological clocks and biological rhythm – circadian.

#### **UNIT – V**

**(15Hrs)**

Movement – nastic and tropic movements. **Seed dormancy** – causes and methods to break seed dormancy – physiology of seed germination – abscission – and senescence. **Stress physiology** – Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

#### **RECOMMENDED TEXT BOOKS**

1. Datta. S. C. 1989. Plant Physiology. Central Book Depot. Allahabad.
2. Hall. D. V. K. K. Rao. Photosynthesis. Arnold London
3. Jain, VK. 2017. Fundamentals of Plant Physiology, S.Chand & Company Ltd.,
4. Salisbury. F. B., C. W. Ross. 1992 Plant Physiology. Wassworth Pub. Co. Belmont
5. Verma, SK. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi

#### **REFERENCE BOOKS**

1. Bidwell. R. G. S. 1979. Plant Physiology. Macmillon Delhi.
2. Gauch. H. G. 1972 Inorganic Plant Nutrition. Hutchinson & Dowd. New York.
3. Govindji. 1982. Photosynthesis. AP. New York
4. Jacob. W. P. 1979. Plant Hormones and Plant Development. Cambridge University Press. Cambridge
5. Khan. A. A. 1982. The Physiology and Biochemistry of Seed development, Dormancy and Germination. Elsevier. Amsterdam
6. Ting. I. P. 1982. Plant Physiology. Addison Wesley Pb. Philippines
7. Michealis. I. And J. C. Torry. 1956. Plant in Action W. H. Freeman
8. Lea, P. J. and R. C. Leegood. 1993. Plant Biochemistry and Molecular Biology, John Wiley & Sons. New York.

#### **JOURNALS :**

Indian Journal of Physiology and Pharmacology  
International Journal of Physiology

#### **E LEARNING RESOURCES:**

1. <http://www.biologydiscussion.com/plant-physiology-2/water-relation/mechanism-of-absorption-of>

2. <https://www.khanacademy.org/science/biology/photosynthesis-in-plants/photorespiration--c3-c>
3. [http://hsc.csu.edu.au/agriculture/production/3359/plant\\_hormones.htm](http://hsc.csu.edu.au/agriculture/production/3359/plant_hormones.htm)
4. <https://www.advancednutrientsonline.com/>
5. [https://www.researchgate.net/publication/228042145\\_plant\\_stress\\_plant\\_physiology\\_](https://www.researchgate.net/publication/228042145_plant_stress_plant_physiology_)

**COURSE OUTCOMES:**

CO.No.	CO Statement	Knowledge Level
CO 1	Compare the process of plant and water relation	K4
CO 2	Explain the process of photosynthesis and respiration	K4
CO 3	Apply the knowledge on the biosynthesis of secondary metabolites in pharmaceutical industries	K3, K4
CO 4	Discuss the function and mechanism of action of various plant hormones	K4
CO 5	Evaluate stress physiology of plants	K5

**MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME**

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	3	2	3	3
CO 2	1	3	2	3	3
CO 3	1	3	2	3	3
CO 4	1	3	2	3	3
CO 5	1	3	2	3	3
Average	1	3	2	3	3

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
 E Content, Videos/ Animation,  
 Quiz-Seminar,  
 Peer Learning.

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**CORE PAPER –XII**

**PLANT PHYSIOLOGY**

**COURSE CODE-10SP18/4C/ PPH**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**CORE PAPER -XIII**

**PLANT BIOCHEMISTRY AND BIOPHYSICS**

**COURSE CODE-10SP18/4C/ PBB**

**Teaching hours: 6 / Week**

**Credits: 4**

**90/ Semester**

**L-T- P**

**3- 3- 0**

## COURSE OBJECTIVES

To enable the students to

1. Study the nature, structure, bonding and importance of carbohydrates.
2. Understand the properties and functions of proteins.
3. Impart knowledge on the classification properties and biosynthesis of fats.
4. Recognise the properties and applications of enzymes in industry and medicine.
5. Explore bioenergetics, laws of thermodynamics and its applications in biological systems.

## COURSE OUTLINE:

### UNIT – I

(20Hrs)

Atomic structure; chemical bonds- ionic bond, covalent bond, coordination bond, hydrogen bond; radioactivity; hydrogen ion concentration (pH), buffers. Biomolecules: Carbohydrates – properties of mono, oligo and polysaccharides. Structure and functions of trioses, tetroses, pentoses, hexoses, maltose, sucrose, starch and pectin, glycosidic linkage, glycoproteins, isomerism and mutarotation.

### UNIT – II

(15Hrs)

Biomolecules: Amino acids and proteins, ionic forms of aminoacids, general reactions of aminoacid metabolism. zwitterion, isoelectric pH, optical isomers of amino acids, physical properties of amino acids. Formation of peptide bond – peptides- structure of polypeptides - primary, secondary, tertiary and quaternary protein structure - super secondary structures. Ramachandran plot - denaturation of proteins. Protein sequencing.

### UNIT – III

(20Hrs)

Biomolecules: Lipids- Classification, structure and properties - Fatty acids- saturated and unsaturated fatty acids - phospholipids, glycolipids, steroids. – Biosynthesis and Oxidation of fatty acid - Glyoxalate pathway – Gluconeogenesis.

### UNIT – IV

(15Hrs)

Enzymes- Properties- apoenzyme, Cofactors, metallic activators coenzymes. Nomenclature, Classification - Enzyme kinetics – Concept of active sites, Michaelis-Menton constant - mechanism of enzyme action- enzyme inhibitors- allosteric control of enzymes. General principles of extraction and purification of enzymes – Enzyme immobilization. Application of enzymes in industry and medicine.

### UNIT – V

(20Hrs)



Bioenergetics - Laws of thermodynamics - enthalpy, entropy and free energy. Exergonic and endergonic reactions. Redox potential. Structure and hydrolysis of high energy compound – ATP, Application of first and second law of thermodynamics in biological systems.

#### RECOMMENDED TEXT BOOKS

1. Agarwal O.P. Chemistry of Organic products. Volume 1, Goel Publishing house, 2014.
2. Dinesh puri. Text book of medical biochemistry .2006. Elsevier pub.
3. Gurdeep R. Chatwal, Organic Chemistry of Natural Products Volume 2, Himalaya Publishing House, 1997.
4. Jain.J.L. Fundamentals of Biochemistry, Vijaya Printers, Chennai, 2016
5. Mathew George, Lincy Joseph.Textbook of Pharmaceutical Chemistry.VivaBooks Pvt.Ltd. 2009
6. Pankaja Naik .Essentials of Biochemistry 2012. Jaypee pub.

#### REFERENCE BOOKS

1. Principles of Biochemistry by A.L.Lehninger, D.L.Nelson & M.M.Cox. (2012) Worth Publishers, New York.
2. Biochemistry by L.Stryer (2015) Freeman & Co, New York.
3. Biochemistry by G. Zubay (1988) Macmillan Publishing Co, New York.
4. The vital force: A study of Bioenergetics by F.M.Harold (1986) Freeman & Co, New York.
5. Andrews, R. Leach. Molecular Modeling: Principles and Applications.
6. Voet and Voet, 1992. Biochemistry, John Wiley & Sons, Inc., New York, USA.

#### JOURNALS:

1. The Journal of Biochemistry
2. Indian journal of biochemistry and biophysics

#### E-LEARNING RESOURCES:

1. [https://www.angelo.edu/faculty/kboudrea/index\\_2353/Chapter\\_07\\_2SPP.pdf](https://www.angelo.edu/faculty/kboudrea/index_2353/Chapter_07_2SPP.pdf)
2. [https://www.angelo.edu/faculty/kboudrea/index\\_2353/Chapter\\_09\\_2SPP.pdf](https://www.angelo.edu/faculty/kboudrea/index_2353/Chapter_09_2SPP.pdf)
3. [https://biochem.wisc.edu/sites/default/files/symposia/steenbock/36th/36th\\_Steenbock\\_Abstract\\_Book\\_web.pdf](https://biochem.wisc.edu/sites/default/files/symposia/steenbock/36th/36th_Steenbock_Abstract_Book_web.pdf)
4. [http://people.uleth.ca/~steven.mosimann/bchm2000/Bchm2000\\_L11.pdf](http://people.uleth.ca/~steven.mosimann/bchm2000/Bchm2000_L11.pdf)
5. [https://www.rose-hulman.edu/~brandt/Chem330/Biochem\\_Thermodynamics.pdf](https://www.rose-hulman.edu/~brandt/Chem330/Biochem_Thermodynamics.pdf)

#### COURSE OUTCOMES

CO.No.	CO Statement	Knowledge Level
CO 1	Discuss the atomic structure, bonding and also structure and functions of carbohydrates	K4
CO 2	Outline the nature , structure and functions of protein	K3, K4

<b>CO 3</b>	Analyse the classification, nature, structure, functions and biosynthesis of fats	K4
<b>CO 4</b>	Explain the nature, structure, functions and applications of enzymes in industry and medicine	K3, K4
<b>CO 5</b>	Evaluate bioenergetics, laws of thermodynamics, ATP and its applications in biological systems	K3, K4

#### **MAPPING**

<b>CO / PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>

#### **TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning.

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI-600 008.**

(For candidates admitted during the academic year 2018-2019)

**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CORE PAPER -XIII**

**PLANT BIOCHEMISTRY AND BIOPHYSICS**

**COURSE CODE-10SP18/4C/ PBB**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

#### PRACTICAL -IV: COVERING CORE PAPERS IX and X

10SP18/4C/PR4

**COURSE**

**CODE-**

Teaching hours: 8/ Week

**Credits: 4**

120/ Semester

**L-T- P**

**0-0- 8**

#### **COURSE OBJECTIVES:**

To enable the students to

1. Study the plant pigments.
2. Understand the mechanism of photosynthesis.
3. Find out the effect of plant growth hormones.
4. Estimate the biochemical compound in plants.
5. Understand various enzymatic activities in plants.

#### **COURSE OUTLINE:**

## PLANT PHYSIOLOGY

1. Extraction and separation of photosynthetic pigments of C<sub>3</sub> and C<sub>4</sub> plants by paper chromatographic method.
2. Extraction and separation of photosynthetic pigments of C<sub>3</sub> and C<sub>4</sub> plants by thin layer chromatographic (TLC) method.
3. Extraction and separation of photosynthetic pigments of C<sub>3</sub> and C<sub>4</sub> plants by Column chromatographic method.
4. Extraction and separation of photosynthetic pigments by Chemical method.
5. Estimation of Chlorophyll a, Chlorophyll b and Total chlorophyll by Arnon's method.
6. Estimation of Carotenoids by using colorimeter.
7. Determination of absorption spectra of Chlorophyll a and Chlorophyll b by using colorimeter.
8. Determination of water potential by Plasmolytic method
9. Deficit (DPD) by weighing method.
10. Determination of effect of Chemicals on membrane permeability (Colorimetrically)
11. Determination of effect of Temperature on membrane permeability (Colorimetrically)
12. Effect of varying intensities of light on the rate of photosynthesis of an aquatic plant by using Wilmott's Bubble Counter
13. Effect -of varying wave lengths of light (Or Quality of light)on the rate of photosynthesis of an aquatic plant by using Wilmot's Bubble Counter.
14. Effect of varying concentrations of CO<sub>2</sub> on the rate of photosynthesis of an aquatic plant by using Wilmot's Bubble Counter.

## DEMONSTRATION EXPERIMENTS PLANT PHYSIOLOGY

1. Dye reduction test (Hill's Reaction)
2. Estimation of total nitrogen by Kjeldhal method.
3. Bio- assay of 2,4-D.
4. Bioassay of kinetin.

## PLANT BIOCHEMISTRY

1. Basic Biochemistry - Preparation of different types of solutions.
2. Principles of Photometry - Colorimeter and Spectrophotometer- principles and Applications.
3. To find complimentary colour for different coloured solutions by using colorimeter.
4. Preparation of standard graph for potassium dichromate (K<sub>2</sub> Cr<sub>2</sub>O<sub>7</sub>) by using colorimeter (OR) Verification of Beer- Lambert Law by using colorimeter.
5. Principles of pH meter and application.
6. Determination of pH of lemon juice and detergent powder by using pH meter.
7. Determination of neutralization point of acid- base mixture by titration method using pH meter.
8. Estimation of glucose by anthrone reagent method colorimetrically.
9. Estimation of aminoacids by ninhydrin method colorimetrically.
10. Estimation of proteins (Lowry's method and Bradford method).
11. Extraction and separation of known and unknown amino-acids by using Paper Chromatographic method.
12. Assay of the enzyme Catalase.
13. Assay of the enzyme Peroxidase.

## DEMONSTRATION EXPERIMENTS PLANT BIOCHEMISTRY AND BIOPHYSICS

1. Dialysis
2. Warburg manometer
3. Preparation of Buffers
4. Polyacrylamide Gel Electrophoresis (PAGE and SDS PAGE)

Simple problems based on theory syllabus.

**Bonafide record of practical work done should be submitted for the practical examination**

### COURSE OUTCOMES

CO.No.	CO Statement
CO 1	Compare the importance of pigments in various plants
CO 2	Predict the physiological mechanisms of plants
CO 3	Demonstrate the importance of plant growth hormones
CO 4	Analyse the biochemical constituents of plants
CO 5	Evaluate the enzymatic activity of plants

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**M. Sc. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

### PRACTICAL EXAMINATION

**TITLE OF THE PAPER: PRACTICAL –IV**

Max Marks- 100

**PAPER CODE: 10SP18/4C/PR4**

Practical- 85

Record- 10

Viva-voce- 5

Time- 4 hrs

1. Determine the water potential of the given plant material **A** by plasmolytic method.

(10)

2. Conduct the experiment **B** assigned to you. Record your observation, analyze and interpret the results.

(13)

3. Verify Beer- Lambert's Law with the given sample **C** by using colorimeter. Record your observation and interpret the results.

(10)

4. Conduct the experiment **D** assigned to you. Record your observation, analyze and interpret the results.

(13)

5. Write the protocol for the experiment **E** assigned to you.

(6)

6. Write the principle for the given instrument **F**.

(5)

7. Solve the Biochemistry Problems **G1, G2, G3** and **G4**.

(3+3+3+3=12)

8. Identify and comment on **H, I, J** and **K**.

(4×4=16)

### **ELECTIVE- V**

#### **BIOINSTRUMENTATION AND METHODOLOGY**

	<b>COURSE</b>	<b>CODE-</b>
	<b>10SP18/4E5/BME</b>	
<b>Teaching hours: 4 / Week</b>	<b>Credits: 3</b>	
<b>60/ Semester</b>	<b>L-T- P</b>	
	<b>2- 2- 0</b>	

#### **COURSE OBJECTIVES:**

To enable the students to

1. Understand the principle, techniques and applications of instruments used in biology
2. Acquire knowledge about microscopy and its applications
3. Understand the applications of Spectroscopy
4. Know the importance of nanobiotechnology and its application.
5. Impart knowledge to write research project.

## **COURSE OUTLINE:**

### **UNIT – I**

**(10Hrs)**

**Microtomy** – Rotary microtome – Fixatives, Dehydration, Paraffin sectioning. Stains, Micrometry, Centrifugation – Types. **Chromatography** – Paper Chromatography – Thin layer Chromatography – Column Chromatography – Gas Chromatography – Liquid Chromatography.

### **UNIT – II**

**(10Hrs)**

**Microscopy** – Principle, Types of microscopes – Applications, Electron microscopes – Scanning and Transmission microscopes, Different Fixation and staining techniques for EM. Freeze – etch and Freeze fracture methods for EM.

### **UNIT – III**

**(15Hrs)**

**Spectroscopic techniques** – Principles and Applications – Visible and ultraviolet (UV) spectroscopy, Infra-red spectrophotometry, Nuclear-magnetic Resonance (NMR) spectrometry, Mass spectrometry. **PCR, PAGE, Southern and Northern blotting, RFLP, RAPD, AFLP based DNA fingerprinting**

### **UNIT – IV**

**(10Hrs)**

**Nanotechnology**- tools, techniques, advantages. Nanoparticles - characterization, production. Nanobiosensors, DNA nanotechnology, Biomedical Applications - disease diagnosis, gene therapy and drug delivery.

### **UNIT – V**

**(15Hrs)**

Writing the research report – The components of research report – Title – Authors and address, abstract – summary – synopsis – key words – introduction – review of literature – materials and methods – results – discussion – acknowledgements – General introduction and General discussion.

## **RECOMMENDED TEXT BOOKS**

1. Recombinant DNA and biotechnology. A guide for teachers. ASM Press.
2. Manasi Karkare 2008 . Nanotechnology: Fundamentals and Applications.IK Pub.
3. Jeremy Ramsden 2011. Nanotechnology: An Introduction. Elsever Publication
4. Mahesh, A. B. Vedamurthy 2003. Biotechnology-4 : Including Recombinant DNA Technology, Environmental Biotechnology and Animal cell culture. New age Int.Pub.
5. Gurumani.N. Research Methodology for Biological Sciences. MJP .2006
6. Karp.G. Cell And Molecular Biology. John Wiley And Sons , New York. 2002.
7. Patania.V.B. Spectroscopy.Campus Books.2002.
8. Veerakumari.L Bioinstrumentation. MJP. Publishers, Chennai Publishers, Chennai.2006.
9. Recombinant DNA and biotechnology. A guide for teachers. ASM Press.
10. Manasi Karkare 2008 . Nanotechnology: Fundamentals and Applications.IK Pub.

## REFERENCE BOOKS

1. Trigiano, R.N., and D.J. Gray (eds.). 2000. Plant tissue culture concepts and laboratory exercises. CRC Press. (Textbook).
2. Kyte, M., and Kleyn, J. 1996. Plant from test tubes. Timber Press. Auge, R. et al., 1995.
3. *In vitro* culture and its applications in horticulture. Science Publishers, Inc. Crispeels, M.J. and D. E. Sadava. 2003.
4. Plants, genes and agriculture. Jones and Bartlett Publishers. Gamborg, O.L. and G. C. Phillips (eds). 1995.
5. Plant cell, tissue and organ culture. Springer Lab Manual. Potrykus, I, and G. Spangenberg (eds.). 1995.
6. Gene transfer to plants. Springer Lab Manual. Jones, H. 1996. Plant gene transfer and expression protocols. Methods in molecular biology . 49. Humana Press. Kreuzer, H, and A. Massey. 1996.
7. Mick Wilson, Kamali Kannangara, Geoff Smith - 2002 Nanotechnology: Basic Science and Emerging Technologies. Chapman and Hall.

## JOURNAL REFERENCE

- 1.[www.researchgate.net/publication/229505564\\_Restriction\\_fragment\\_length\\_polymorphism\\_RFLP](http://www.researchgate.net/publication/229505564_Restriction_fragment_length_polymorphism_RFLP)  
American Journal of Physical Anthropology 32(S10):159 - 184 · January 1989
- 2.International Journal Current Microbiology Applied Sciences (2015) 4(8): 379-386  
ISSN: 2319-7706 Volume 4 Number 8 (2015) pp. 379-386 <http://www.ijcmas.com>

## E LEARNING RESOURCES:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/>
2. <https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/07/Chapter1011.pdf>
3. [http://www.zmb.uzh.ch/static/bio407/assets/Script\\_AK\\_2014.pdf](http://www.zmb.uzh.ch/static/bio407/assets/Script_AK_2014.pdf)
4. [cfamm.ucr.edu/documents/fei-em.pdf](http://cfamm.ucr.edu/documents/fei-em.pdf)
- 5.[https://www.researchgate.net/publication/325548216\\_Characterization\\_Techniques\\_for\\_Nanoparticles\\_Comparison\\_and\\_Complementarity\\_upon\\_Studying\\_Nanoparticle\\_Properties](https://www.researchgate.net/publication/325548216_Characterization_Techniques_for_Nanoparticles_Comparison_and_Complementarity_upon_Studying_Nanoparticle_Properties)

## COURSE OUTCOMES:



CO.No.	CO Statement	Knowledge Level
CO 1	Explain the principles, methodology, types, techniques and application of microtomy, micrometry, centrifuge and chromatography	K3
CO 2	Apply technique in microscopy its principle and types. Fixation and staining technique for EM	K3
CO 3	Evaluate principle , applications and types of spectroscopy., electrophoresis, PCR, RFLP, RAPD, AFLP, DNA finger printing	K4
CO 4	Discuss about synthesis, characterization and biomedical application of nanotechnology	K3, K4
CO 5	Plan to write research report with all the research component	K6

#### MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	3	1	3	3
CO 2	1	3	1	3	3
CO 3	1	3	1	3	3
CO 4	1	3	1	3	3
CO 5	1	3	2	3	3
Average	1	3	1.2	3	3

#### TEACHING METHODOLOGY:

Lecture (Chalk and Talk-OHP-LCD),

E Content, Videos/ Animation,

Quiz-Seminar,

Peer Learning.

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**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE- V**

**BIOINSTRUMENTATION AND METHODOLOGY**

**COURSE CODE-10SP18/4E5/BME**

**QUESTION PAPER PATTERN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2,K3</b>	<b>A-10X2 marks</b>	<b>50</b>	<b>20</b>	<b>100</b>	<b>Question No.- is compulsory</b>
<b>K3</b>	<b>B-5/8x8 marks</b>	<b>500</b>	<b>40</b>		
<b>K4,K5</b>	<b>C-2/3X20 marks</b>	<b>1500</b>	<b>40</b>		

**ELECTIVE- V**  
**NANOBIOTECHNOLOGY**

	<b>COURSE</b> <b>10SP18/4E5/NBT</b>	<b>CODE-</b>
<b>Teaching hours: 4 / Week</b>	<b>Credits: 3</b>	
<b>60/ Semester</b>	<b>L-T- P</b>	
	<b>2- 2- 0</b>	

**COURSE OBJECTIVES:**

1. Understand the principle and techniques of nanotechnology.
2. Acquire knowledge about biological nano objects.
3. Study about methods of nanobiotechnology.
4. Know the importance of Green nanotechnology and its applications.
5. Impart knowledge on biological membranes.

**COURSE OUTLINE:**

**UNIT – I**

**(10Hrs)**

*Introduction*

History of Nanotechnology, Difference between Nanoscience and Nanotechnology, Green nanotechnology, Bottom up and top down approaches.

**UNIT - II**

**(10Hrs)**

*Biological Nano-Objects*

Structural and Functional Regulation of DNA: Geometry, Topology and Methylation : Geometry of the DNA Double Helix - The Z Conformation of DNA.- Supercoiled DNA - Methylation of DNA,Protein–Lipid Assembly and Biomimetic Nanostructure.

**UNIT - III**

**(10Hrs)**

*Biological Membranes*

Biological Membranes - Lipid Membranes: Structure and Properties - Models and Methods for Characterising Membranes - Protein–Lipid Assembly - **Applications of Biomimetic Membranes**

**UNIT – IV**

**(15Hrs)**

*Methods of Nanobiotechnology*

Optical tools – Nanoforce and imaging – Surface methods – Mass spectrometry – Electrical Characterization and Dynamics of Transport – Microfluidics : **Concepts and Applications to the Life Sciences.**

**UNIT – V**

**(15Hrs)**

*Applications of Nanobiotechnology*

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

**REFERENCE BOOKS**

1. Industrial Pharmaceutical Biotechnology, Heinrich Klefenz, Wiley-Vch Publication, Germany, 2002.
2. Pharmaceutical Biotechnology, Daan Crommelin, Robert D Sindelar, 2002, Tailor and Francis Publications, Newyork, 2002.
3. Hand book of Pharmaceutical Biotechnology, Jay P Rho, Stan G Louie, 2003, Pharmaceutical products press, Newyork, 2003
4. Theory and practice of industrial pharmacy, Lachman L Lieberman, HA, Kanig, J, 1986, 3rd edition, Varghese publishing & Co, New Delhi, 2000.
5. Remington’s Pharamaceutical sciences, Joseph Price Remington , 18th edtion, Mack publishing & Co., Easton, 1980.

**COURSE OUTCOMES:**

CO.No.	CO Statement	Knowledge Level
CO 1	Discuss about history , process of green nanotechnology	K3
CO 2	Explain about structural and functions of DNA	K3
CO 3	Outline about biological membranes – lipid, protein and its applications	K4
CO 4	Analyse methods of nanobiotechnology, nanoforce,imaging,mass spectrophotometry, microfluidics	K4

	and applications	
<b>CO 5</b>	Evaluate applications of nanobiotechnology in PCR, DNA micro array , biochips, biosensors and pharmaceutical applications	K5

**TEACHING METHODOLOGY:**

Lecture (Chalk and Talk-OHP-LCD),  
E Content, Videos/ Animation,  
Quiz-Seminar,  
Peer Learning.

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**M. Sc DEGREE EXAMINATION**

**II M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**ELECTIVE- V**

**NANOBIOTECHNOLOGY**

**COURSE CODE-10SP18/4E5/NBT**

**QUESTION PAPER PATTERN**

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K1,K2,K3	A-10X2 marks	50	20	100	Question No.- is compulsory
K3	B-5/8x8 marks	500	40		
K4,K5	C-2/3X20 marks	1500	40		

**SOFT SKILL - IV**  
**BIOINFORMATICS**

**COURSE CODE-**

**10SP15/4S/BIN**

**Teaching hours: 2/ Week**

**Credits: 2**

**30/ Semester**

**L-T- P**

**2- 0- 0**

**UNIT – I**

**(6 Hrs)**

Introduction to Bioinformatics – Definitions. Proteomics. Genomics. Applications of Bioinformatics

**UNIT – II**

**(6 Hrs)**

Gene prediction, Predicting secondary structure of RNA. Predicting molecular structure and functional domains of proteins.

**UNIT – III**

**(6 Hrs)**

Bioinformatics-Taxonomic classification- Operational taxonomic unit. Methods of phylogenetic analysis – Phenetic method and Cladistic method of analysis - Molecular phylogeny.

**UNIT – IV**

**(6 Hrs)**

Microarray- Protein array, RNA arrays, DNA microarrays- Applications. Drug targeting.

**UNIT – V**

**(6 Hrs)**

Techniques in Bioinformatics- FASTA, BLAST, Multiple Sequence Analysis- Open Reading Frame.

## **REFERENCE BOOKS**

1. Andrews R. Leach. Molecular Modeling: Principles and Applications
2. Ignacimuthu, S. Plant Biotechnology, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
3. Leonard , Banaszak. Foundation of Structural Biology
4. Rastogi, S. C1993, Mandiratta, Namita, Rastogi, Parag.. Bioinformatics-Concepts, Skill Applications
5. Shanmugavel. P. Principles of Bioinformatics Pointer Publication Jaipur.
6. Sundaralingam. R, Kumaresan. V, (2012). Bioinformatics, Saras Publication,
7. Ignacimuthu . S ( 2013) Basic Bioinformatics Alpha Science International Limited,

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**M. Sc DEGREE EXAMINATION**

**I M. Sc PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**SOFT SKILL - IV**

**BIOINFORMATICS**

**COURSE CODE-10SP15/4S/BIN**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>	<b>Special Instructions if any</b>
<b>K1,K2</b>	<b>A-5/5X2 marks</b>	<b>50</b>	<b>10</b>	<b>50</b>	<b>Question No.- is compulsory</b>
<b>K 3</b>	<b>B-4/6X5marks</b>	<b>250</b>	<b>20</b>		
<b>K4,K5</b>	<b>C-1/2X20marks</b>	<b>1500</b>	<b>20</b>		