SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]
[Accredited by NAAC with 'A' Grade with CGPA of 3.27]
[Recognized 2(f) & 12(B) Status under UGC Act of 1956]
Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)
Tamil Nadu, India
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DEGREE OF MASTER OF SCIENCE IN BOTANY

CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR

M.Sc. BOTANY PROGRAMME

(SEMESTER PATTERN)

(For Students Admitted in the College from the

Academic Year 2020-2021 Onwards)

Programme Outcomes (POs)

PO1	Able to comprehend basic principles of Botany.
PO2	Explain concept and current applications of plant sciences and advances in the relevant subject areas including microbial, environmental, food, pharmaceutical and ethno medical sciences.
PO3	Describe structure and reproduction of different forms of plant life from lower to higher group and to compare life cycles of various groups of plants.
PO4	Explore quantitative parameters of plant community.
PO5	Provide importance to technical terms in all branches of botany and construct floral formula and floral diagram of a flower.
PO6	Acquire knowledge pertaining to analysis data and interpret biological results.
PO7	Demonstrate principles and practical experience of a wide range of biochemical techniques in plant science innovations.
PO8	Understand scope of Botany for further education, research and employment approaches and to manage projects in multidisciplinary.

Programme Specific Outcomes (PSOs)

PSO1	Students will gain in depth knowledge about lower forms, morphology, taxonomy, anatomy and embryology of plants towards their identification and classification to involve plants further in biochemical and pharmaceutical aspects.
PSO2	Students will be able to apply biostatistics & bioinformatics tools and biophysical principles for the analysis of relevant biological situations and develop intellectual skills on biological data and databases.
PSO3	Students will acquire knowledge to explicate ecological interlinking of life on earth by studying energy and nutrient flow through the environment. They will able to correlate physical features of the environment with structure of populations, communities and ecosystem.
PSO4	Students will gain basic knowledge on local, rare, endangered, endemic, and exotic medicinal plants, their therapeutic values and cultivation practices for their effective conservation.
PSO5	Students will be able to inter-relate integral and ubiquitous role of microbes with their environment. Students will acquire knowledge to recognize plant diseases and their management in economically important crop plants.

SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Master of Science (B.Sc.) in Botany

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)

Sl. No.	Nature of the Course	Course Code	Name of the Course	Hours / Week	Credit	Marks		
						CIA	ESE	Total
SEMESTER I								
1	Core – I	20PBO1C01	Plant Diversity – I (Algae, Fungi, Lichen and Bryophytes)	6	5	25	75	100
2	Core – II	20PBO1C02	Plant Diversity – II (Pteridophytes, Gymnosperms and Paleobotany)	6	5	25	75	100
3	Core – III	20PBO1C03	Microbiology and Plant Pathology	5	4	25	75	100
4	Core Practical – I	20PBO1P01	Practical – I (Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms, Paleobotany, Microbiology and Plant Pathology)	9	4	40	60	100
5	Elective – I	20PBO1E01	Algal Biotechnology	4	4	25	75	100
Total				**30**	**22**	**140**	**360**	**500**
SEMESTER II								
6	Core – IV	20PBO2C04	Plant Systematics	5	4	25	75	100
7	Core – V	20PBO2C05	Anatomy, Embryology of Angiosperms and Microtechniques	5	5	25	75	100
8	Core – VI	20PBO2C06	Cell Biology, Genetics and Molecular Biology	5	5	25	75	100
9	EDC	---	Extra Disciplinary Course (EDC) (Other than Botany Major Subject)	4	4	25	75	100
10	Common Course	20P2HR01	Human Rights	2	2	25	75	100
11	Core Practical – II	20PBO2P02	Practical – II (Plant Systematics)	3	3	40	60	100
12	Core	20PBO2P03	Practical – III	6	4	40	60	100

	Practical – III		(Anatomy, Embryology of Angiosperms, Microtechniques, Cell Biology, Genetics and Molecular Biology)					
Total				**30**	**27**	**205**	**495**	**700**
SEMESTER III								
13	Core – VII	20PBO3C07	Ecology, Phytogeography and Remote Sensing	6	4	25	75	100
14	Core – VIII	20PBO3C08	Plant Biotechnology and Nanotechnology	6	4	25	75	100
15	Elective – II	20PBO3E02	Herbal Technology	6	4	25	75	100
16	Elective – III	20PBO3E03	Wood Technology	6	4	25	75	100
17	Core Practical– IV	20PBO3P04	Practical – IV (Ecology, Phytogeography, Remote Sensing, Plant Biotechnology and Nanotechnology)	6	4	40	60	100
Total				**30**	**20**	**140**	**360**	**500**
SEMESTER IV								
18	Core – IX	20PBO4C09	Plant Physiology, Plant Biochemistry and Biophysics	6	4	25	75	100
19	Core – X	20PBO4C10	Research methodology, Bioinstrumentation, Biostatistics and Bioinformatics	6	4	25	75	100
20	Elective – IV	20PBO4E04	Horticulture and Forestry	6	4	25	75	100
21	Project	20PBO4PR	Project Work	6	5	40	60	100
22	Core Practical – V	20PBO4P05	Practical – V (Plant Physiology, Plant Biochemistry, Biophysics, Bioinstrumentation, Biostatistics and Bioinformatics)	6	4	40	60	100
Total				**30**	**21**	**155**	**345**	**500**
Cumulative Total				**120**	**90**	**640**	**1560**	**2200**
Sl. No.	**Extra Disciplinary Course (EDC) (Other than Botany major students)**							
1	EDC	20PBO2EDC0	Horticulture	4	4	25	75	100

		1						
		20PBO2EDC02	Herbal Botany	4	4	25	75	100

***Core Practical Examinations will be conducted at the end of every semester.**

Note:

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

SWAYAM –Study Webs of Active-Learning for Young Aspiring Minds

NPTEL –National Programme on Technology Enhanced Learning

Major Elective Courses

1. Algal Biotechnology
2. Herbal Technology
3. Wood Technology
4. Horticulture and Forestry

Common Course

1. Human rights

Extra Disciplinary Courses (EDC)

1. Horticulture
2. Herbal Botany

PROGRAMME SYLLABUS

Program: M.Sc. Botany				
Core – I	**Course Code:** 20PBO1C01		**Course Title:** Plant Diversity – I (Algae, Fungi, Lichen and Bryophytes)	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	6	90	5	100

Course Objectives

1. To enhance the knowledge on diverse assemblage of lower plant groups.
2. To gain insight about life cycles of various algae, fungi, lichen and bryophytes.
3. To analyze the importance of lower plant groups.
4. To evaluate economic importance of lower plant groups.

UNIT – I

Algae: Classification of algae by F.E. Fritsch (1935-45). General characteristic features of algae: Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae.

UNIT – II

Structure, reproduction and life cycle of the following genera: *Oscillatoria, Navicula, Ulva, Padina* and *Gracilaria.* Culture and cultivation of freshwater and marine algae. Economic importance of algae.

UNIT – III

Fungi: Classification of Fungi by C.J. Alexopoulos (1962). Heterothallism in fungi, sexuality in fungi, Parasexuality, sex hormones in fungi. Mycoryhizal fungi, Economic importance of fungi. Structure, reproduction and life cycle of the following genera:

Plamsodiophromycetes : *Plasmodiophora*

Oomycetes : *Phytophthora*

Zygomyctes	:	*Rhizopus*
Ascomycetes	:	*Taphrina*
Basidiomycetes	:	*Polyporus*
Deuteromycetes	:	*Fusarium*

UNIT – IV

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

UNIT – V

Bryophytes: Classification of Bryophytes by E.V. 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 cycle of the following genera: *Targionia, Porella, Funaria* and *Polytrichum.*

Text Books

1. Alam, A. (2020). Contemporary Research on Bryophytes Book Series: Recent Advances in Botanical Science.
2. Aziz, F and Rasheed, R (2019). A Course Book of Algae. Publisher: University of Sulaimani, Iraq.
3. Bessey, E.A. (1950), Morphology and Taxonomy of Fungi. : London, Constable & Company, Limited; the Blakiston Company, Philadelphia.
4. Chopra, R.N. Kumar, P.K. (1988). Biology of Bryophytes. John Wiley, New York.
5. Dinabandhu, S and Kaushik. B.D. (2012). Algal Biotechnology and Environment. I.K. International, New Delhi.
6. Hale, M.E. (1961). A Hand Book of Lichens. University of California Press. London
7. John Webster and Roland W.S. Weber. (1985), Introduction to Fungi. Third Edition. Cambridge University Press. London
8. Mahendra Rai. (2009). Advances in Fungal Biotechnology. I.K. International Publishing, House, New Delhi.

9. Mihir Kumar, D. (2010). Algal Biotechnology. *Daya Publishing House*, New Delhi.
10. Parihar, N.S. (1987). An Introduction to Embryophyta Volume 1 Bryophyta, Central Book Depot, Allahabad.
11. Sahoo, D. (2000). Farming the Ocean: Seaweeds Cultivation and Utilization. Aravali International, New Delhi.
12. Sambamurthy, A.V.S.S. (2005). A Text of Alga. I.K. International Publishing House Pvt. Ltd. New Delhi.
13. Sharma, O.P. (1986) A Text Book of Algae. McGrawHill, New Delhi.
14. Sharma, O.P. (2011). Diversity of Microbes and Cryptogams/Algae. Tata Mc Graw Hill Education Private Ltd., New Delhi.
15. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
16. Vashishta, B.R., Sinha A.K and Singh V.P. (2008). Botany for Degree Students. Algae. S.Chand and Co, New Delhi.
17. Vashishta, P.C. (2014). Botany for Degree Students Bryophytes. Chand & Company Ltd., New Delhi.
18. Vashishta, P.C. (2014). S.Chand & Company Ltd., New Delhi.
19. Watson, E.V. (1971). The Structure and Life of Bryophytes. Hutchinson and Co. London.

Reference Books

1. Fritsch, F.E. (1935). Structure and Reproduction of algae. Vol I and Vol II, Cambridge University Press. Cambridge.
2. Graham, L.E. (1993). Origin of Land Plants, John Wiley and Sons Inc. New York.
3. Hojnacka, K., Wieczorek, P.P., Schroeder, G., Michalak, I. (Eds.) (2018). Algae Biomass: Characteristics and Applications. Developments in Applied Phycology.
4. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. (1983). Microbiology, Tata MaGraw Hill Publishing House, New Delhi.
5. Puri, P. (1980). Bryophytes. Atma Ram and Sons, New Delhi.
6. Round, F.E. (1981). The Ecology of Algae. CUP, Cambridge.
7. South, G.R. and Whittick, A. (1987). Introduction to Phycology, Blackwell Scientific Publications. Oxford.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Identify and describe primitive plants such as algal, fungi and bryophytes.	K1
CO2	Summarize the classification of lower plant groups	K2
CO3	Illustrate the morphology and reproduction of selected algae, bryophytes and fungal forms.	K3
CO4	Find out the economic and ecological importance of lower group of plants.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong H – High M – Medium L – Low

Program: M.Sc. Botany				
Core – II		**Course Code:** 20PBO1C02	**Course Title:** Plant Diversity – II (Pteridophytes, Gymnosperms and Paleobotany)	
Semester I	**Hours/Week** 6	**Total Hours** 90	**Credits** 5	**Total Marks** 100

Course Objectives

1. To learn the classification, structure and organization of lower vascular plants.
2. To outline the transition of lower vascular plants.
3. To understand their reproduction and life cycle pattern.
4. To study the primitive and advanced features of living and fossil forms.

UNIT – I

Pteridophytes: 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 of Pteridophytes.

UNIT – II

Range of Morphology, Structure, Reproduction and Evolution of Gametophytes and Sporophytes of following genera: *Angiopteris, Polypodium, Osmunda, Salvinia* and *Isoetes*

UNIT – III

Gymnosperms: General characters – Range of structure – Anatomy - Reproduction, Phylogeny and Classification (K.R. Sporne, 1954). Phylogeny and Economic importance of Gymnosperms.

UNIT – IV

Structure (Exomorphic and endomorphic) - reproduction and life history of the following genera: *Araucaria, Cupressus* and *Gnetum*.

UNIT – V

Paleobotany: 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: *Lepidocarpon*, *Pentoxylon*, and *Cordaites.*

Text Books

1. Bhatnagar and Moitra, (1996). Gymnosperms. New age International Publishers, New Delhi.
2. Bhatnagar, S.P and Moitra, A. (1996). Gymnosperms, New Age Int. Pvt. Ltd., New Delhi.
3. Biswas, C. and Johri, B.M. (2004). The Gymnosperms. Narosa Publishing House, New Delhi.
4. Johri, R.M. Snehlata and Sandhya Sharma, (2004). A Textbook of Pteridophyta. Vedams Books (P) Ltd., New Delhi.
5. Johri, RM, Lata S, Tyagi K (2005). A text book of Gymnosperms, Dominate Pub and Distributer, New Delhi.
6. Rasheed, A. (1999). An Introduction to Pteridophyta, Vikas Publishing Co., New Delhi.
7. Raup, D.M and Steven, M. Stanley. 2004. Principles of paleontology. San Francisco, London.
8. Sharma, O.P. (2006). Pteridophyta. Tata McGraw-Hill Education, New York.
9. Sharma, O.P. (2012). Textbook of Pteridophyta, TATA MacMillan India Ltd., New Delhi.
10. Smith, G.M. (1955). Cryptogamic Botany Vol. II, Tata Mcgraw Hill Publishing Co. Ltd., New Delhi.
11. Sporne, K.R. (1991). The Morphology of Gymnosperm. B.I. Publications, New Delhi.
12. Stewart, W.N and Rathwell, G.W. (1993). Paleobotany and the Evolution of Plants. Cambridge University Press.
13. Vashishta, P.C., Sinha and Anilkumar (2010). Pteridophytes, S. Chand & Company Ltd, New Delhi.
14. Vashishta. P.C.(1990). Pteridophyta, S. Chand & Co. Ltd, New Delhi.
15. Vashista, P.C. (1976). Gymnosperms, S.Chand & Co. New Delhi.

16. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India. W.H. Freeman Edition, New York.

Reference Books

1. Arnold C.A. (1972). An introduction to Paleobotany, McGraw-Hill Publishers. New York.
2. Arora M.P. (1990). Evolutionary biology, Himalaya Publication House, New Delhi.
3. Atchlay W.R. and Woodnuff D.S. (1981). Evolution and Speciation, Cambridge University Press, Cambridge.
4. Bierhost, D.W. (1971). Morphology of Vascular plants. McMillan Company, New York.
5. Bower. F.O. (1939). The Ferns (Vol. I, II & III), Today & Tomorrow's Printers, New Delhi.
6. Chamberlain, C.J. (1934). Gymnosperms: Structure and Evolution. Chicago Reprinted (1950) New York.
7. Delveloryas, T. (1962). Morphology and Evolution of Fossil Plants. Holt, Rinehart and Winston, New York.
8. Doyle, W.T. (1970). Non Vascular Plants: Form and Function. Belmont, California.
9. Eames, A.J. (1936). Morphology of Vascular Plants Lower groups, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
10. Foster and Gifford, Jr., (1962). Comparative Morphology of Vascular Plants. Allied Pacific Pvt. Ltd., Bombay.
11. Sporne, K.R. (1970). The morphology of Pteridophytes (The structure of Ferns and Allied Plants) Hutchinson University, London.
12. Sporne, K.R. (1972). The Morphology of Pteridophytes, B.I. Publications, Madras.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Recognize various forms of pteridophytes and gymnosperms.	K1
CO2	Understand the characteristics features and classification of pteridophytes and gymnosperms.	K2
CO3	Illustrate the morphology and reproduction of selected pteridophytes and gymnosperms.	K3
CO4	Analyze the chronological events by studying the fossils.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong H – High M – Medium L – Low

Program: M.Sc. Botany				
Core – III		**Course Code:** 20PBO1C03	**Course Title:** Microbiology and Plant Pathology	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	5	75	4	100

Course Objectives

1. To understand growth and morphology of microbes.
2. To disseminate knowledge on cultural techniques of microorganisms.
3. To understand the economical importance of microorganisms.
4. To gain knowledge on plant disease management.
5. To establish an overview of the recent advances in the field of microbiology.

UNIT – I

Microbiology: History and Scope of Microbiology – Microbial diversity and Classification (Bergey and Holt, 1993) – Bacteria – types – Structure and Reproduction – Actinomycetes – Virus Classification – Viruses Structure and Reproduction – Bacteriophages – Mycoplasma – prions.

UNIT – II

Sterilization techniques – Types and Preparation of media – Industrially important microorganisms – Microbial metabolites – Fermentor (Bioreactor) design and operation – types of fermentation – Downstream processing.

UNIT – III

Microbiology of food – Dairy products – Cheese and Yoghurt – Food spoilage – Food preservation methods – Industrial production of Bioproducts (Alcohol, Lactic acid, Amylase, and

Penicillin) – Immobilization techniques – Bioremediation and Biodegradation – Industrial wastes treatment – Xenobiotic compounds.

UNIT – IV

Plant Pathology: History of Plant pathology, Classification of Plant diseases, Koch's Postulates, Disease cycle, Dispersal of plant pathogens, Inoculum, Inoculum potential, Pre-penetration structures produced by pathogens, Penetration, Infection, Defense mechanism in plants, Role of Enzymes and Toxins in Plant pathogenesis and disease forecasting. Methods of disease control – Plant quarantine.

UNIT – V

A Study of the disease symptoms, causal organism, and transmission and control Measures of the following plant diseases.

1. Damping off by *Pythium*
2. Little leaf of Brinjal (Mycoplasma)
3. Bacterial Blight of beans
4. Bunchy top of Banana (Virus)
5. Citrus canker (Bacteria)
6. Blight of potato (Early Late blight)
7. Tobacco mosaic disease (TMV)

Text Books

1. Bergey, D. H. and Holt, J. G. (1993). Bergey's manual of determinative bacteriology. 9th ed. Baltimore: Williams & Wilkins, New York.
2. Bilgrami, K.S. and Dube, H.C. (2010) A text book of Modern Plant Pathology – Vikas Publishing House (P) Ltd., New Delhi.
3. Dubey, R.C., and Maheswari, D.K. (2014). A text book of Microbiology, S.Chand & company, New Delhi.
4. Freifelder, D. (1990). Microbial genetics. Narosa Publishing House, New Delhi.

5. Luke, S.P. Moore, James C. Hatcher. (2019). Infectious Diseases, Microbiology and Virology A Q&A Approach for Specialist Medical Trainees. Cambridge University Press.
6. Powar, C.B. and Dagniwala, H.F. (2008). General Microbiology. Himalaya Publishing House, Bombay.
7. Sharma, P.D. (2012). Microbiology – Rastogi and Co, Meerut. New Delhi.

Reference Books

1. Agrawal, A.K., and Parihar, P. (2006). Industrial microbiology, Student Edition, Jodhpur.
2. Alexander, (1978). Introduction to soil Microbiology, Wiley Eastern Private Ltd., New Delhi.
3. Carpenter, P.L. (1977). Microbiology, W.B. Saunders Co., London.
4. Darglos, J. (1975). Bacteriophages. Chapman & Hall Ltd., London.
5. Gardner E.J, Simmons M.J, Snustad D.P. (2010) Principle of Genetics (VIII Edition), WSE India Pvt. Ltd., New Delhi.
6. William, D. Stansfield, Raul Cano and Jaime Colome (1996). Schaun's outline of theory and problems of Molecular and Cell biology. McGraw Hill, New York.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Enumerate the characteristics features of microorganisms.	K1
CO2	Describe various isolation and cultural techniques of the microorganisms.	K2
CO3	Explain the economical importance of microbes.	K2
CO4	Implement the disease management techniques in the fields.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong **H – High** **M – Medium** **L – Low**

Program: M.Sc. Botany				
Core Practical – I		**Course Code:** 20PBO1P01	**Course Title:** Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms, Paleobotany, Microbiology and Plant Pathology	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	9	135	4	100

Course Objectives

1. To enable students to know about diversity of lower group of organisms.
2. To understand the cellular organization of Bryophytes, Pteridophytes and Gymnosperms.
3. To study the fossil remains of plants in the division of Paleobotany.

Algae: Micro preparation and detailed microscopic analysis of vegetative and reproductive parts of the following genera – *Oscillatoria, Navicula* (Diatoms), *Ulva, Padina, and Gracilaria.* Economic importance of Algae (Spirulina, Agar agar, Caragennean, SCP and Diatoms)

Fungi: Micro preparation and detailed microscopic analysis of vegetative and reproductive parts of the following genera –*Plasmodiophora; Phytophthora; Rhizopus; Taphrina; Polyporus* and *Fusarium.* Lichens - Usnea

Bryophytes: Micro preparation and detailed microscopic analysis of vegetative and reproductive parts the following Bryophytes – *Targionia, Porella, Funaria* and *Polytrichum.*

Pteridophytes: Study of the Habit, T.S of leaf and Stem, Morphology of Reproductive structures of Following genera. *Angiopteris, Polypodium, Osmunda, Salvinia* and *Isoetes.*

Gymnosperms: Study of the Habit, TS of leaf and stem, Morphology of Reproductive structures of following genera *Araucaria, Cupressus* and *Gnetum.*

Paleobotany: Study the following fossil members, *Lepidocarpon, Pentoxylon,* and *Cordaites* through permanent slides.

Microbiology Experiments

1. Isolation and identification of bacteria and fungi from soil sample and spoiled food.
2. Inoculation of bacteria in the Peptone broth and bacterial streaking in the petriplate.
3. Preparation of culture media (Bacteria).
4. Gram's staining of bacteria found in milk, curd and root nodules.
5. Testing quality of milk by Methylene blue reduction test (MBRT)

Demonstration

1. Media preparation and culturing of Cyanobacteria.
2. Preparation of spawn for cultivation of edible mushroom (oyster).
3. Mass cultivation of *Rhizobium, Azotobacter*.
4. Microbiological test for soil fertility (Phosphate solubilizing Bacteria).
5. Production of citric acid using *Aspergillus niger*.
6. Fermentation - Solid state, submerged.

Note: Visit to nearby leading laboratories / industries.

Plant Pathology: Study of the disease symptoms, causal organism, transmission and control measures of the following plant diseases:

1. Damping off by *Pythium.*
2. Little leaf of Brinjal (Mycoplasma).
3. Bacterial Blight of beans.
4. Bunchy top of Banana (Virus).
5. Citrus canker (Bacteria).
6. Blight of potato (Early Late blight).
7. Tobacco mosaic disease (TMV).

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

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Compare and classify the lower forms and advanced Thallophytes.	K4
CO2	Distinguish the internal organization of Cryptogams and Phanerogams.	K4
CO3	Analyze the fossil plant through permanent slides.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**H**	**H**	**S**	**M**
CO2	**S**	**M**	**H**	**M**	**H**
CO3	**H**	**S**	**H**	**S**	**S**

S – Strong H – High M – Medium L – Low

SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)
KATTERI – 636 902
PG MODEL PRACTICAL QUESTION PAPER
End semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2020-21 onwards)

Core Practical – I **Algae, Fungi, Lichen Bryophytes, Pteridophytes, Gymnosperms, Paleobotany, Microbiology and Plant Pathology**

Time: 4 Hours

Max. Marks: 60 Marks
Practical : 50 Marks
Record : 5 Marks
Viva –Voce : 5 Marks

BREAK UP OF MARKS

1. Make suitable micro preparations of A, B and C. Draw labeled sketches. Identity giving reasons. Leave the slides for valuations. (3 × 4 = 12)

2. With suitable micro preparations of D and E. Draw labeled sketches. Identity giving reasons. Leave the slides for valuations. (2 × 4 = 8)

3. Draw diagrams and write notes of interest of F, G, H and I. (4 × 2 = 8)

4. Name the Genus and group of the macroscopic specimens of J, K and L. (3 × 3 = 9)

5. Determine whether the given sample M is contaminated with bacteria or not. Leave the slide for evaluation. (5 Marks)

6. Name the causative organism, disease symptoms and control measures of the pathological specimen N. (8 marks)

KEY

A, B and C = Algae, Fungi and Bryophytes

Preparation – 1, Identification -1, Diagram -1, Reason -1 = 4 (3 x 4 = 12)

D and E = Pteridophytes / Gymnosperms (2 x 4 = 8)

Preparation – 1, Identification -1, Diagram -1, Reason -1 = 4

F, G, H and I = Micro slides (Algae/Fungi/Bryophytes/Pteridophytes/Gymnosperms)

Slides, spotters, Specimen, Photo cards. (4 × 2 = 8)

J, K and L = Macroscopic specimens (Algae/Fungi/Bryophytes/Pteridophytes/Gymnosperms)

Genus (1), Group (1) and Morphology (1) (3 × 3 = 9)

M = Microbiology - Material/Sample to be given 5 Marks

N = Pathological specimen 8 marks

Program: M.Sc. Botany				
Elective – I		**Course Code:** 20PBO1E01	**Course Title:** Algal Biotechnology	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	4	60	4	100

Course Objectives

1. To understand concepts of resource potential of algae.
2. To know the commercial importance of algae.
3. To learn the therapeutic properties of algae.
4. To provide an overview of the role of algae in the environment.

UNIT – I

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 of algae.

UNIT – II

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

Therapeutic uses – Remedial compounds, antioxidants, antithrombotic, anticoagulants, wound healing, skin diseases, antiulcerogenic, antifungal, antibiotics and anti-tumour, antiviral compounds. Production of pigments and utilization. Role of algae in agriculture and aquaculture – Symbiotic algae.

UNIT – IV

Immobilization of algae: Natural compounds of immobilization, methods of immobilization, recombinant DNA technology in algae. Isolation, fusion and regeneration of protoplasts in macro algae.

UNIT – V

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.

Text Books

1. Aziz, Farhad and Rasheed, Rezan (2019). A Course Book of Algae. Publisher: University of Sulaimani.
2. Bold, H.C. and Wynne, M.J. (1978). Introduction to the Algae. Structure and Function. Prantice Hall of India New Delhi.
3. Kumar, H.D. and Singh, H.N. (1982). A text Book on Algae. Affiliated East-West Press Pvt. Ltd. New Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Sambamurty, A.V.S.S. (2015). A Textbook of Algae. S Chand publications, New Delhi.
6. Trivedi, P.C. (2001). Algal Biotechnology. Point publisher, Jaipur, India.

Reference Books

1. Alexopoulous, C.J. and Bold, H.C. (1978) Algae and Fungi. The Macmillan Co. London.
2. Baddiley, S. Carey, N.H. Higgins, I.J. and Potter, W.G. (1994). Microalgae: Biotechnology and Microbiology, Cambridge University Press. Cambridge.
3. Becker, E.W. (1994). Micro algae Biotechnology and Microbiology. Cambridge University Press.
4. Borowitzka, M.A. and Borowitzka, L.J. (1988) Microalgal Biotechnology, Cambridge University Press, Cambridge.
5. Chapman, V.J. (1962). The Algae. Macmillan and Co. Ltd. New York.
6. Dixon, P.S. (1973). Biology of Rhodophyta. Hafner Press. New York.

7. Fogg, G.E. (1953). The metabolism of Algae. Methuen & Co. London.
8. Fritsch, F.E. (1935). The structure and reproduction of algae, Vol. I. University Press, Cambridge.
9. Fritsch, F.E. (1945). The structure and reproduction of algae, Vol. II. University Press, Cambridge.
10. Hojnacka, K., Wieczorek, P.P., Schroeder, G., Michalak, I. (Eds.) (2018). Algae Biomass: Characteristics and Applications. Developments in Applied Phycology.
11. Ignacimuthu, S. (1996). Basic Biotechnology. Tata Mc Graw Hill Publishing Ltd. New Delhi.
12. Morris, I. (1968). An Introduction to the Algae, Hutchinson University Library, London.
13. Prescott, G.W. (1969). The Algae: A Review, Thomson Nelson & Sons. London.
14. Round, F.E. (1973). The Biology of Algae. Edward Arnold. London smith, G.M. 1955. Cryptogamic Botany Vol. I Mc Graw-Hill Co. New York.
15. Smith, G.M. (1955). Cryptogamic Botany Vol. I Mc Graw – Hill Co. New York.
16. Smith, S and Reed, D.J. (1997). Mycorrhizal symbiosis. Academic Press. The University of Adelaide, Adelaide, Australia
17. Trehan, K. (1990). Biotechnology. Naroisa Pub. House. London.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Gain knowledge on commercial utility of algae.	K1
CO2	Explain the industrial applications of algae.	K2
CO3	Summarize the medicinal uses of algae.	K2
CO4	Demonstrate the role of algae as indicator in environmental health.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong **H – High** **M – Medium** **L – Low**

Program: M.Sc. Botany				
Core – IV		**Course Code:** 20PBO2C04	**Course Title:** Plant Systematics	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	5	75	4	100

Course Objectives

1. To study about the classification and nomenclature of Angiosperms.
2. To understand the theory and practices involved in plant systematics.
3. To learn the striking affinities of different plant families.
4. To acquire the fundamental values of plant systematics.
5. To establish a suitable method for correct identification and adequate characterization of plants.
6. To be aware of the importance of taxonomic relationships in plant systematic studies.

UNIT – I

Historical account of the classification of angiosperms up to the present day. Systems of classification – Detailed study of Bentham and Hooker, Bessey, Takhtajan, Cronquist and APG IV – merits and demerits. ICN – history, principles, typification, principles of priority and their limitations, effective and valid publication, author citation, retention, choice and rejection of names, names of hybrids.

UNIT – II

Computer aided taxonomy (TROPICOS, IPNI, The Plant List). Taxonomic tools – flora, monograph, icons and journals. Keys – dichotomous keys and their uses. Botanical gardens. Sources of taxonomic information – embryology, cytology, chemotaxonomy. RET species – India, Tamil Nadu and IUCN criteria, 2012.

UNIT – III

Biosystematics – Aim and scope. Phenotypic Plasticity. Turreson's work. Modern trends in Taxonomy – Computerized Systematics – collecting data, converting and documenting characters of plants in computers – Molecular taxonomy – DNA Fingerprinting and Barcoding of plants.

UNIT – IV

Study of the diagnostic characters, economic importance, systematics and phylogeny of Menispermaceae, Polygalaceae, Oxalidaceae, Meliaceae, Vitaceae, Sapindaceae, Rosaceae, Combretaceae, Onagraceae, Lythraceae and Aizoaceae.

UNIT – V

Study of the diagnostic characters, economic importance, systematics and phylogeny of Oleaceae, Gentianaceae, Convolvulaceae, Boraginaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Aristolochiaceae, Orchidaceae, Commelinaceae and Cyperaceae.

Text Books

1. Bennet, S.S.R. (1989). An Introduction to Plant Nomenclature. International Book Distribution, India.
2. Heslop, J and Herrison, (1970). New Concepts in Flowering Plants - Taxonomy. Heinemann Educational Books, India, Revised Edition.
3. Heywood, V.H. (1967). Plant Taxonomy, Edward Arnold, London.
4. Jeffery, C. (1982). An introduction to Plant Taxonomy, J& A Churchill Ltd., London
5. Lawrence, G.H.M. (1995). The Taxonomy of Vascular Plants (Vol I-IV), Central Book, Dept., Allahabad.
6. Mathew, K.M. (1983). The Flora of Tamil Nadu Carnatic, The Rapinat Herbarium, Tiruchirappalli.
7. Pandey, B.P. (1997). Taxonomy of Angiosperms, S. Chand & Co., New Delhi.
8. Pandey, S.N. and Misra, S.P. (2008). Taxonomy of Angiosperms, Ane Books India, New Delhi.
9. Rendle, A.R. (1979). A Classification of Flowering Plants. Cambridge University Press.

10. Sambamurty, A.V.S.S. (2005). Taxonomy of Angiosperms, I.K. International Pvt. Ltd., New Delhi.
11. Saxena NB. and Shamindra Saxena (2001). Plant Taxonomy, K.K. Mittal for Pragati Prakasham, Meerut, New Delhi.
12. Sharma, O.P. (2009). Plant Taxonomy. Tata McGraw-Hill Education Private Limited, New Delhi.
13. Sharma, O.P. (2017) Plant Taxonomy (II Edition). The McGraw Hill Companies, New York, United States.
14. Singh, V. and Jain, K.K. (1989). Taxonomy of Angiosperms – Rastogi, Meerut, India.
15. Sivaraajan, V.V. (1989). Introduction to Principles of Plant Taxonomy, Oxford and IBH, New Delhi.
16. Sokal, S.R. and Sneath, P.H. (1977). Numerical Taxonomy: The principle and practice of Numerical Classification. San Francisco: Freeman.
17. Solbig, (1985). Principles and Methods of Plant Biosystematics, The MacMillan Company, New Delhi.
18. Stace Clive, A. (1989). Plant Taxonomy and Biosystematics, Edward Arnold, London, Second Edition.
19. Vashista, P.C. (1990). Taxonomy of Angiosperms, S. Chand & Co., New Delhi.

Reference Books

1. Davis, P.H and Heywood, V.M. (1965). Principles of Angiosperm Taxonomy, Published by Van Nostrand.
2. Gamble, J.S, Fisher, L.E.F. (1967). The Flora of The Presidency of Madras. BSI, Calcutta.
3. Hutchinson, J. (1973). The Families of Flowering plants, Oxford University press, London.
4. Kress J.W, Wurdack, K.J., E.A C., Zimmer, L.A. Weigt and Janzen D.H. (2005). Use of DNA bar codes to identify flowering plants. Proc. Natl. Acad. Sci. USA 102, 8369-8374.
5. Simpson M.G. (2006). Plant systematics, Elsevier Academic Press, USA.
6. Stoeckle, M. (2003). Taxonomy, DNA and the barcode of life .Bioscience 53: 796-797.

7. Takhtajan A.L. (2009). Evolutionary trends in flowering plants, Bishen Singh Mahendra Pal Singh, Dehra Dun.
8. Takhtajan, A.L. (2009). Flowering Plants – Origin and dispersal – Oliver & Boyd. Publisher: Edinburgh.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Acquire knowledge both on ICN and APG classifications.	K1
CO2	Differentiate various systems of classifications based on their natural and phylogenetic characters of flowering plants.	K2
CO3	Apply the proficiency skills on identification of any unknown plant species using the manual of floras.	K3
CO4	Classify the plants based on their phylogeny.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong H – High M – Medium L – Low

Program: M.Sc. Botany				
Core – V		**Course Code:** 20PBO2C05	**Course Title:** Anatomy, Embryology of Angiosperms and Microtechniques	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	5	75	5	100

Course Objectives

1. To understand the histochemical techniques involved in permanent micro slides.
2. To acquire knowledge about complex vascular tissues.
3. To inherit knowledge on mega and micro sporangial development and their functions.
4. To attain knowledge about various aspects of anatomical features of plants.
5. To understand the key aspects of embryology of angiosperms.

UNIT – I

Tissues – Definition and Classification. Meristems – types – Theories regarding shoot and root apex – apical cell theory, Histogen theory, Tunica corpus theory – quiescent centre. Vascular cambium and cork cambium – types, origin and development of periderm, polyderm, rhytidome, lenticels. Complex tissue: xylem and Phloem elements. Dendrochronology – sap wood and heart wood – arrangement of vessels in secondary xylem. Difference between primary and secondary structure of xylem and phloem. Compression wood and tension wood.

UNIT – II

General characters of anomalous secondary thickening in dicot and monocot stem. *Aristolochia, Boerhaavia, Bignonia, Achyranthes, Nyctanthes* and *Dracaena*. Secondary structure and vascular differentiation of root, shoot and root transition – Ontogeny of Dorsiventral and Isobilateral leaf. Nodal anatomy-uni, tri and multilacunar nodes.

UNIT – III

Embryology – Structure and development of anther. Microsporogenesis; Ultrastructure of pollen wall; Pollen–stigma incompatibility, methods to overcome incompatibility, structure, development and types of ovules, megasporogenesis and female gametophyte (*Polygonum* type of embryosac development).

UNIT – IV

Fertilization and its control, Endosperm – Nuclear, cellular and helobial and Ruminate types. Development of embryo – dicot and monocot. Embryology in relation to taxonomy. Apomixis, Polyembryony and Parthenocarpy.

UNIT – V

Microtechnique: A broad outline on steps involved in microtome sectioning (Fixation, dehydration, clearing, infiltration, embedding and block making), staining techniques, Types of Microtome, Camera lucida- Principle and their uses, Micrometry and Photomicrography.

Text Books

1. Bhojwani, S.S. and Bhatnagar, S.P. (1981). The Embryology of Angiosperms. Vikas, Publishing House Pvt. Ltd., New Delhi.
2. Crang, R., Lyons-Sobaski, S and Wise, R. (2018) Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants. Springer International Publishing.
3. Eames, A.J. and Mc Daniels, L.H. (1979). An Introduction to Plant anatomy. Tata McGraw-Hill Publishing Co., (P) Ltd., Bombay, New Delhi.
4. Maheswari, P. (1976). An introduction to the Embryology of Angiosperms. TATA McGraw Hill Publishing Co., Ltd., New Delhi.
5. Marimuthu R. (2011). Microscopy and Microtechnique. MJP publishers Chennai.
6. Pandey, B.P. (1978). Plant Anatomy, S. Chand & Co., New Delhi.
7. Patki L.R, Bhalchandra B.L, and Jeevaji I.H. (1987). An introduction to Microtechnique, S.Chand and company (Pvt) Ltd, New Delhi.
8. Pijushroy, (2010). Plant Anatomy, New central Book Agency, Pvt Lit, New Delhi.
9. Singh, V. Pande, P.C. and Jain D.K. (1987) – Anatomy of seed plants – Rastogi Publications, Meerut.

Reference Books

1. Austin, (1968). Fertilization. Prentice Hall of India, New Delhi.
2. Cutter, E.G. (1970). Plant Anatomy: Experimental and Interpretation. Edward Arnold Pub. Ltd., London.
3. Cutter, E.G. (1971). Plant Anatomy, Edward Arnold Pub. Ltd., London.
4. Cutter, E.G. (1978). Plant Anatomy, Experimental and Interpretation. Edward Arnold Pub. Ltd., London
5. Davis, G.L. (1966). Systematic Embryology of the Angiosperms. John Wiley. New York.
6. Dwivedi, J.N. (1988). Embryology of Angiosperms. Rastogi & Co., Meerut. New Delhi.
7. Esau, K. (1960). Plant Anatomy, Wiley Eastern Private Ltd., New Delhi.
8. Esau, K. (1977). Anatomy of seed plants. Wiley Eastern Publication, New Delhi.
9. Fahn, A. (1989). Plant Anatomy. Macmillan Publication (P) Ltd, Singapore.
10. Johansen, D.A. (1940). Plant Microtechnique, TATA McGraw Hill Book Co., Ins., New Delhi.
11. Johri, B.M. (1984). Experimental Embryology of Vascular plants. An International Journal for Botany and Mycology. 4:3, 364-370.
12. Kenneth R. Sporne (1972). The Evolution of Pollen Types in Dicotyledons. New Phytologist.71:1; 181-185.
13. Peter Gray. (1964). Hand book of Basic Microtechnique. McGraw Hill Publication, New York.
14. Rahavan, V. (1976). Experimental Embryogenesis in Vascular Plants, Academic Press, London.
15. Shivanna, K.R. and B.M. Johri. (1985). The Angiosperm Pollen Structure and Functions. Wiley- Eastern Ltd.
16. Sporne, K.R. (1972). The Evolution of Pollen Types in Dicotyledons. New Phytol.71: 181-185.
17. Steven Ruzi. (2005). Plant Microtechnique and Microscopy. Oxford University Press, London.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Knowledge on plant tissue and cellular organelles	K1
CO2	Explain the anomalous growth in plants.	K2
CO3	Illustrate the fertilization and development of embryo.	K3
CO4	Differentiate tissues using various microtechnique.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong **H – High** **M – Medium** **L – Low**

Program: M.Sc. Botany				
Core – VI		**Course Code:** 20PBO2C06	**Course Title:** Cell Biology, Genetics and Molecular Biology	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	5	75	5	100

Course Objectives

1. To provide an overview of the cellular and molecular aspects of the plant cell.
2. To describe normal chromosome number, structure, and behavior in plant cells.
3. To get the insight on the principles of inheritance as formulated by Mendel.
4. To understand the molecular biology of prokaryotes and Eukaryotes.

UNIT – I

Cell biology: Cell structure, organization of prokaryotic and eukaryotic cell. Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, structure and function of cytoskeleton and its role in motility.

UNIT – II

Nucleosome organization, chromosome structure in prokaryotes and eukaryotes, Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, electrical properties of membranes. Cell division and cell cycle: Mitosis and meiosis, their regulation, different phases in cell cycle, regulation and control.

UNIT – III

Genetics: Mendelian principles - Dominance, Segregation and independent assortment, Genetic interaction - Complementary genes, Epistasis, Lethal genes, Multiple factor hypothesis. Linkage and crossing over – kinds of linkage, significance of linkage. Types of crossing over mechanism,

models for homologous recombination. Construction of genetic map. Two point test cross, three point test cross.

UNIT – IV

Sex Determination and differentiation – Types, mechanism and significance. Sex linked inheritance Population genetics – Hardy – Weinberg Law. Mutation – types, spontaneous, induced mutation. Numerical changes in chromosomes – Euploidy, polyploidy. Structural changes in chromosomes – deletion, Duplication, Inversion and Translation.

UNIT – V

Molecular Biology: The central dogma and structure of DNA and RNA; DNA Replication mechanism, models of replication. Transcription: in Prokaryotes and Eukaryotes, post transcriptional modification, genetic code, Translation – synthesis and processing of protein. Post translational modification. Organization of gene – regulation of gene, Operon concept, regulation of gene expression in prokaryotes – Lactose, Tryptophan, gene expression in eukaryotes.

Text Books

1. Ajoy Paul, (2009). Text Book of Cell and Molecular Biology, Books and Allied (P) Ltd Kolkata.
2. Baluska, F. and Vaidurya Pratap Sahi (2018) Concepts in Cell Biology – History and Evolution. Botanical Institute, Karlsruhe Institute of Technology, Karlsruhe, Germany.
3. David Freifelder, (1985). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
4. Freifielder, D. (1995). Microbial Genetics. Narosa Publication, New Delhi.
5. Gupta, P.K. (2009). Genetics, Rastogi publications, Meerut, New Delhi.
6. Janet Iwasa, Gerald Karp, Wallace F. Marshall (2018) Karp's Cell Biology, Global Edition.
7. Kumar, H.D. (1999). Molecular Biology. Vikas Publishing House Pvt. Ltd. New Delhi.
8. Satyesh Chandra Roy and Kalyan Kumar De. (1999). Cell Biology. New Central Book Agency (P) Ltd. Calcutta.

9. Verma P.S and Agarwal V.K. (2007). Cell Biology, Genetics, Molecular Biology and Evolution, S. Chand and Company Ltd., New Delhi.
10. Verma P.S. and Agarwal V.K. (2010) Genetics, S. Chand and Company Ltd., New Delhi.

Reference Books

1. De Robertis and De Robertis, (1998). Cell and Molecular Biology. B.I. Waverly Pvt. Ltd. New Delhi.
2. Geoffrey M. Cooper. (1997). The Cell – A Molecular approach. ASM Press, Washington.
3. Grierson, D. and Covey, S.N. (1984). Plant Molecular Biology. Blackie and sons, London.
4. Griffiths, A.J.F., Miller, J.H. and Suzuki, D.T. (2000). An Introduction to Genetic Analysis. 7th edition. New York.
5. Karp.G. (2008) Cell and Molecular Biology. 5th Edn. John Wiley & sons, London.
6. Lewin (2007). Gene IX. Jones and Barlett Pub. Sudbury, Massachusetts.
7. Strickberger, M.W. (2010). Genetics (3rd edition) PHI Learning Pvt. Ltd. New Delhi.
8. Walker J.M and Rapley, R. (2006). Molecular Biology and Biotechnology (4th Edn) Panima Publishing Corporation, New Delhi.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Gain insight in fundamentals of cell morphology with functions.	K1
CO2	Understand the biosynthesis of nucleic acids and cell division.	K2
CO3	Solve the relationship between phenotype and genotype.	K3
CO4	Distinguish the molecular aspects in prokaryotes and Eukaryotes and its gene expression.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong **H – High** **M – Medium** **L – Low**

Program: M.Sc. Botany				
Core Practical – II		**Course Code:** 20PBO2P02	**Course Title:** Plant Systematics (Practical - II)	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	3	45	3	100

Course Objectives

1. To identify selected taxa using taxonomic keys.
2. To understand the theory and practices involved in plant systematics.
3. To learn the striking affinities of different plant families.
4. To study the economically important plants in traditional methods.

Taxonomy and Biosystematics

Identification of Specimen at family, generic and specific level belonging to the following families.

1. Menispermaceae
2. Polygalaceae
3. Oxalidaceae
4. Meliaceae
5. Vitaceae
6. Sapindaceae
7. Rosaceae
8. Combretaceae
9. Onagraceae
10. Lythraceae
11. Aizoaceae
12. Oleaceae

13. Gentianaceae
14. Convolvulaceae
15. Boraginaceae
16. Bignoniaceae
17. Pedaliaceae
18. Nyctaginaceae
19. Aristolochiaceae
20. Orchidaceae
21. Commelinaceae
22. Cyperaceae

- Economic importance of families mentioned above.
- Familiarity with the use of Flora.
- Preparation of Dichotomous artificial key using locally available plants.
- A field trip of not less than four days to a place of luxuriant vegetation to study. The flora and to study the different types of vegetation.
- Submission of a tour report and 20 herbarium sheets (Specimens collected from Tour collection/locally available plants during the internal practical examination.

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

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Construct keys to identify unknown plants.	K3
CO2	Classify the plants into species, genus and family.	K4
CO3	Summarize the economic uses of plants.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S

S – Strong **H – High** **M – Medium** **L – Low**

SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)
KATTERI – 636 902
PG MODEL QUESTION PAPER (PRACTICALS)
End semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2020-21 onwards)
Core Practical – II (Plant Systematics)

Time: 4 Hours **Max. Marks: 60 Marks**

Practical : 50 Marks
Record : 5 Marks
Viva –Voce : 5 Marks

BREAK UP OF MARKS

1. Find out the binomials of A, B and C. (3 × 3 = 9 marks)

2. Refer specimens D, E and F to their respective families, give the reasons at each level of Hierarchy. (3 × 4 = 12 marks)

3. Construct a key using G, H, I, J, and K (5 × 2 = 10 marks)

4. Mention the family, genus and species of L, M and N (3 × 3 = 9 marks)

5. Write economic importance of O, P, Q, R and S. (2 × 5 = 10 marks)

Key

A, B and C Families prescribed in the syllabus
D, E and F Flowering plants from families prescribed in the syllabus
G, H, I, J and K Flowering twigs
L, M and N Plants given in practical syllabus
O, P, Q, R and S Economic importance of families

Program: M.Sc. Botany				
Core Practical – III		**Course Code:** 20PBO2P03	**Course Title:** Anatomy, Embryology of Angiosperms, Microtechniques, Cell Biology, Genetics and Molecular Biology	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	6	90	4	100

Course Objectives

1. To know the variations in the internal structural organization of plants.
2. To gain knowledge on chromosomes.
3. To understand the basic concept and modern techniques of microtome.
4. To study about the principles of Mendelian and non-Mendelian inheritances.

Anatomy, Embryology of Angiosperms and Microtechniques

Preparation of hand sections, maceration and clearing

1. Temporary and permanent mounting of whole specimens and Sections using different types of mountants.
2. Calibration of microscope through micrometry.
3. Microtomy and microtome sectioning
4. Maceration of wood elements by various chemical methods and micrometry.
5. Examining of different cell and tissue types with help of suitable techniques.
6. Structure of (primary and or secondary) leaf, root, stem and floral parts (including fruits).
7. Examining of vascular cambium and study of its activity.
8. Examining of anomalous secondary thickening mentioned in syllabus.
9. Examining of structural and identification of wood of some common Indian Timbers such as *Prunus, Mangifera indica, Terminalia, Tectona grandis, Swietenia mahagoni, Azadirachta indica, Lagerstroemia* and *Pterocarpus.*

Embryology of Angiosperms

1. Organization of anther and pollen, pollen wall patterns, pollen germination and pollen tube growth.
2. Study on ovary, ovules and their modification.
3. Isolation of plant embryos and embryonic tissues.

Note:

1. A minimum of 10 double stained permanent sections to be submitted.
2. Record and observation note book.
3. Wax blocks and slides mounted with wax ribbons.
4. Group report on ontogenetic change in a selected plant.

Cell Biology

1. Squash and smear techniques –Onion root tip (mitosis) *Rheo* flower bud (Meiosis).
2. View of plant cell inclusions – Cystolith and Raphides, Chloroplast (*Hydrilla* leaf).
3. Isolation of plant organelles by centrifugation techniques (Demonstration).
4. Separation of giant chromosome (*Chironomus* larvae).

Genetics

1. Evaluation of Genetic concept by solving problem of Mendelian hypothesis.
2. Genetic Interaction (Mendelian modified ratios) complementary, supplementary, duplicate factor, Multiple alleles.
3. Population genetics- Hardy Weinberg law.
4. Three point test cross – chromosome map.
5. Isolation of auxotrophs by UV mutatgenesis (Demonstration).
6. Isolation of spontaneous mutations in bacteria by gradient plate technique (Demonstration).

Molecular Biology

1. Colorimetric estimation of DNA and RNA.
2. Regulation of gene expression (With the help of models /Charts /Book diagram).

3. Protein biosynthesis with the help of models /chart/ Book diagram.

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

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Prepare a transverse section of given plant material.	K3
CO2	Construct a chromosome map.	K3
CO3	Observe the sequential changes in the internal structure of plants by sectioning through microtechniques.	K4
CO4	Explain the sex linked disease among the population.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	M	H	S	S

S – Strong H – High M – Medium L – Low

SRI VIDYA MANDIR ARTS AND SCIENCE COLLEGE (Autonomous)

KATTERI – 636 902

PG MODEL PRACTICAL QUESTION PAPER

End semester Examination Question Paper Pattern

(For the candidates admitted from the academic year 2020-21 onwards)

Core Practical: III Anatomy, Embryology of Angiosperms, Microtechniques, Cell Biology, Genetics and Molecular Biology

Time: 4 Hours **Max. Marks: 60 Marks**

Practical: 50 Marks **Record : 5 Marks**

Viva–Voce : 5 Marks

BREAK UP OF MARKS

1. Prepare a transverse section of A. Identify the anomaly by giving reasons. Draw diagrams and submit the slides for valuation. (6 marks)

2. Macerate and identified the elements in the B. Measure the length or breadth using Micrometer. (6 marks)

3. From the given material C dissect and mount any two stage of embryo. Draw diagrams. Submit the slides for valuation. (6 marks)

4. With the flower bud given in D, identify any 2 developmental stages of microsporogenesis. Draw diagrams. Submit the slides for valuation. (6 marks)

5. Prepare a squash of E. Display any 2 stages of cell divisions. Draw labelled sketches. (4 marks)

6. Construct a chromosome map; calculate interference and coefficient of variation from a three point test cross data given in F. (8 marks)

7. Solve the genetic problem G and H. (2 × 3 = 6 marks)

8. Write notes of interest on I, J, K and L. (2 × 4 = 8 marks)

Key

A, B, C & D Material given in the practical class.

E - Material given in the practical class

F - Construct a chromosome map/Three point test cross data.

G & H- Genetic problem given in the practical (Mono & Dihybrid ratio).

I, J, K, L -Spotters from Anatomy, Micro technique & Embryology (Slide/ Chemical/instrument -Spotter from molecular Biology).

Note:

- Submission of 5 double stained permanent slides (Microtome or free hand sections 2, Cleared material-1, Peel –1 and Maceration-1).
- Certified record work done in the laboratory during practical classes.

EXTRA DISCIPLINARY COURSE

Program: M.Sc. Botany				
Extra Disciplinary Course (EDC)		**Course Code:** 20PBO2EDC01	**Course Title:** Horticulture	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	4	60	4	100

Course Objectives

1. To know the basics in the field of Horticulture.
2. To develop skills in the area of Horticulture.
3. To create knowledge on self employment through entrepreneur skills.

UNIT – I

Importance and History of Gardening – garden implements – Indoor plants and Outdoor plants – Flower arrangement-massing and ikebana – Fruit and Vegetable carving.

UNIT – II

Pods and vegetables. Nursery structures – Green house, shade house, Mist chamber – topiary – Bonsai culture. Floriculture – Rose, Chrysanthemum, Jasmine – cultivation. Hydroponics.

UNIT – III

Types of pots and containers, Potting media – components and types. Propagation, seed and vegetative – cutting, layering and grafting.

UNIT – IV

Gardening- Types of gardens – formal garden – vegetable garden – orchard – terrace garden – Rockery and water garden. Landscaped layout designing – types – formation and maintenance of lawns.

UNIT – V

Manures – microbial inoculants – composting – vermicomposting – fertilizers and their application – Role of phytohormones in horticulture – Irrigation methods.

Text Books

1. Adams, C.R. and Early, M.P. (2004). Principles of Horticulture. Elsevier, New Delhi.
2. Arumugam, N. and Kumaresan, V. (2014). Fundamentals of Horticulture and Plant Breeding. Saras Publication Biosciences Book Publisher. Kanyakumari, India.
3. Barton West, R. (1999). Practical Gardening in India. Discovery Publishing House, New Delhi.
4. Chadha, K.L. (2001). Hand Book of Horticulture, ICAR Publications, New Delhi.
5. George Acquaah. (2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
6. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.
7. Manibhushan Rao, K. (2009) Text book of Horticulture. Macmillan India Ltd. New Delhi.
8. Mazundar, B.C. and Mukhopadhyay, P.M. (2006). Principles & Practices of Herbal Garden. Daya Publishing House, New Delhi.
9. Percy Lancasher. (2004). Gardening in India. Oxford IBH Publishing Company Private Limited, New Delhi.
10. Sadhu, M.K. (1996). Plant Propagation. New Age International Publishers, New Delhi.
11. Sheela, V. L. (2011). Horticulture. MJP Publishers, Chennai.

Reference Books

1. Randhava, G.S. (1973). Ornamental horticulture in India. Today and Tomorrow Printers and Publishers, New Delhi.
2. Williams, C.N., Uzo, J.O. and Peregrine, W.T.H. (1991). Vegetable Production in Tropics. Longman Scientific & Technical, Essex (UK).
3. Yawalkar, K.S. (1961). Vegetable Crops of India. Agri Horticultural Publishing House, Dharmapath, Nagpur.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on cultivation of economically important plants.	K1
CO2	Understand the techniques involved in Horticulture and Management.	K2
CO3	Describe the cutting, layering and grafting techniques.	K3
CO4	Learn hand's on training on Terrarium and Bonsai techniques.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong H – High M – Medium L – Low

Program: M.Sc. Botany				
Extra Disciplinary Course (EDC)		**Course Code:** 20PBO2EDC02	**Course Title:** Herbal Botany	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	4	60	4	100

Course Objectives

1. To learn about the ethnobotanical knowledge.
2. To understand the phytoconstituents in the medicinal plants.
3. To create knowledge on herbal home remedies.

UNIT – I

Brief history of medicinal plants. Indian systems of Medicine: Siddha, Ayurveda, Unani and Naturopathy. Traditional and Folklore medicine – Native medicine. Definition of Drug – Classification of natural drugs: Alphabetical, Morphological, Pharmacological and Chemical.

UNIT – II

Drug adulteration, Drug evaluation, Chemical evaluation and Biological evaluation of drugs, Phytochemical investigations. Chemistry of drugs (Alkaloids, Flavonoids, Glycosides and Tannins). Quality control of herbal drugs.

UNIT – III

Cultivation, macro and microscopic characters, chemical constitutions and therapeutic uses of drugs from root (*Catharanthus roseus* and *Rauwolfia serpentina*), drugs from bark (*Cinchona officinalis*), drugs from stem of wood (*Ephedra* sp) and drugs from underground stem (*Zingiber officinale*).

UNIT – IV

Cultivation, micro and macrostructure, chemical constitutions and therapeutic uses of leaves (*Aloe vera* and *Ocimum sanctum*), flower (*Eugenia jambolana*), fruits and seeds (*Feronia elephantum* and *Coriandrum sativum*).

UNIT – V

Pharmacognosy – Definition and scope. A brief account on drugs acting on central nervous system (CNS stimulants, CNS depressants and Hallucinogens). Drugs used in disorders of gastrointestinal tract (Carminatives, Bulk laxatives and Purgatives) and cardio vascular drugs (Cardiotonics, Cardiodepressants and Antihypertensives).

Text Books

1. Arumugam, K.R. and Murugesh, N. (1990). Text book of Pharmacognosy. Sathya Publishers, Chinnalapatti (Tamilnadu) 624 201.
2. Arumugam, N. and Kumaresan, V. (2014). Fundamentals of Horticulture and Plant Breeding. Saras Publication Biosciences Book Publisher, Kanyakumari, India.
3. Bhattacharjee, S.K. (2004). Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
4. George Acquaah. (2009). Horticulture Principles and Practices. PHI Learning Private Limited, New Delhi.
5. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. Nirali Prakashan, Pune.
6. GuhaBakshi, D.N. Sen Sharma, P. and Pal, D.C. (1996). A Lexicon of Medicinal Plants in India. Naya Prakash, Calcutta.
7. Handa, S. S. and V. K. Kapoor, (1993). Pharmacognosy. Vallabh Prakashan. New Delhi.
8. Harbourne, J. B. (1998). Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.
9. Jain, (2001). Medicinal plants. National Book Trust, New Delhi.
10. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy. JPR Publication, Vallioor, Tirunelveli.
11. Joshi, S.G. (2001). Medicinal plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
12. Kumar, N. (2014). Introduction to Horticulture. Rajalakshmi Publications, Nagercoil.
13. Medicinal Plants Source Book India, (1996). International Library Association, Switzerland.
14. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.

15. Purohit and Vyas, (2004). Medicinal Plants Cultivation. Agrobios Publications, Jodhpur.
16. Sheela, V. L. (2011). Horticulture. MJP Publishers, Chennai.
17. Thirugnanam, (1995). Muligaimaruthuvam (Tamil). Selvipathipakam, Trichy.

Course Outcomes (COs)

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

COs Number	CO Statement	Knowledge Level
CO1	Gain knowledge on ethnobotanical and Indian system of medicine.	K1
CO2	Understand the techniques involved in extraction and characterization of phytoconstituents.	K2
CO3	Explore the various techniques involved in herbal medicines.	K3
CO4	Prepare the herbal medicine as home remedies.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

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CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M

S – Strong H – High M – Medium L – Low

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