DEPARTMENT OF BOTANY				*CLASS: I M.Sc. Botany*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
I	Major Core 2	21P1BMC2	Plant diversity – II	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquaint with the classification, phylogeny, evolutionary trends and life cycle of Pteridophytes and Gymnosperms.
2. To understand the salient features of fossil forms of Pteridophytes and Gymnosperms.
3. To learn the concept of Palaeobotany and economic importance of fossil plants.

UNIT	CONTENT	CLO	K LEVEL	HOURS
I	Pteridophytes: General features and classification (Reimer's, 1954) - Telome concept- life cycle and its origin of Pteridophytes - deviation mechanisms – apogamy and apospory - range of morphology, structure, reproduction and evolution of gametophytes and sporophytes. Fossil Pteridophytes – a brief account on *Rhynia, Lepidodendron, Sphenophyllum* and *Calamites.*	**1**	**Up to K4**	**15**
II	Vegetative and reproductive morphology of living Pteridophytes – general characters of the following orders: psilophytales, lycophytales, equisetales, polypodiales and marsileales. stelar evolution – structure, development and evolution of sorus - heterospory and origin of seed habit - economic importance.	**2**	**Up to K4**	**15**
III	Gymnosperms: General characters – origin of gymnosperms – classification by Sporne, 1965 - salient features of fossil gymnosperms- pteridospermales, bennettitales, pentoxylales, cycadales, cordaitales and coniferales	**3**	**Up to K4**	**15**
IV	General account, distribution, morphology, anatomy, reproduction and phylogeny of cycadales, coniferales and gnetales- economic importance - woods of gymnosperms.	**4**	**Up to K4**	**15**
V	Palaeobotany: Concepts of palaeobotany - geological time scale – fossillization- impressions, compressions, incrustation, casts, molds and petrifications – age determination and methods of study of fossils – carbon dating- role of fossils in oil exploration – palaeopalynology –Birbal Sahni's contributions.	**5**	**Up to K4**	**15**

Books for study:

1. Sporne, K.R. 1970. The morphology of Pteridophytes (The structure of Ferns and Allied Plants), Hutchinson University, London.
2. Pandey, B.P. 1998. A Text Book of Botany Vol. II. S Chand, NewDelhi.
3. Stuart WN (1998). Paleobotany and Evolution of Plants, New York Publications.
4. Parihar, N.S (1967). An introduction to Embryophyta vol. II. Pteridophyta. Central Book Depot, Allahabad.
5. Sporne, K.R (1976). Morphology of Pteridophytes. B.I. Publishers, New Delhi.
6. Smith, G.M. (1955). Cryptogamic Botany. Vol. III. McGraw Hill, New Delhi.
7. Rashid A (2013) An introduction to Pteridophyta – Diversity, Development and Differentiation (2ndedition),Vikas Publications.

Books for Reference:

1. Johri , RM, Lata S , Tyagi K (2005), A text book of Gymnosperms, Dominate pub and Distributer, NewDelhi
2. Vastishta PC Sinha AK Anikumar (2006). Pteridophyta (Revised edition), S. Chand and Company, Pvt. Ltd. New Delhi.
3. Vastishta PC Sinha AK Anikumar (2006). Gymnosperms (Revised edition), S. Chand and Company, Pvt. Ltd., New Delhi.
4. Rashid A (2013) An introduction to Pteridophyta – Diversity, Development and Differentiation (2ndedition),Vikas Publications.

Web Resources:

1. https://www.britannica.com/search?query=Gymnosperms
2. https://www.easybiologyclass.com/classification-of-gymnosperms-by-sporne-short-notes/
3. https://www.britannica.com/plant/plant/Evolution-and-paleobotany
4. https://indiabiodiversity.org

Rationale for Nature of the Course:

Identification of the members of pteridophytes and gymnosperms by observing their characteristic vegetative and reproductive morphology and by referring appropriate manuals/floras.

Conducting field study trip to their natural habitats and to visit vendors of these plant resources to understand their economic values

To document the utilization aspects of these plant divisions at the global level.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

Comparative vegetative and reproductive morphological studies of pteridophytes and gymnosperms

Tracing the evolutionary lineages of living and fossil members these plant divisions with reference to floristic geological time scale

Prospecting the utility of pharmaceutical and timber resources for utilitarian values

Pedagogy:

Chalk and Talk, PPT, Group Discussion, Seminar, Interaction, Problem Solving, Quiz, Virtual Labs & Learning Management System (CANVAS).

Course Learning Outcomes:

CLOs	CLO Statement	Knowledge Level
Students will be able to know, understand, apply and analyse		
CLO -1	the general features, classification, evolution and economic importance of Pteridophytes	Up to K4
CLO -2	the comparative characteristics of Orders of Pteridophytes	Up to K4
CLO -3	the salient features, origin and classification of gymnosperms	Up to K4
CLO -4	the anatomy, reproduction, phylogeny and economic importance of gymnosperms	Up to K4
CLO -5	the concept of paleobotany, geological time scale, fossilization methods and study of fossils	Up to K4

Mapping Programme Specific Outcomes with Course Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	1	2	3	1	2
CLO-2	2	1	3	2	2
CLO-3	3	3	3	3	3
CLO-4	3	3	1	2	3
CLO-5	3	3	2	3	3

3-Advance application, 2- Intermediate level, 1- Basic level

Lesson Plan

Unit	Description	Hrs	Mode
I	a) Pteridophytes: General features and classification (Reimer's, 1954) b) Telome concept- life cycle and its origin of Pteridophytes - deviation mechanisms – apogamy and apospory - range of morphology c) Structure, reproduction and evolution of gametophytes and sporophytes d) Fossil Pteridophytes – a brief account on *Rhynia*, *Lepidodendron*, *Sphenophyllum* and *Calamites.*	2 5 5 3	Chalk and talk PPT, LMS Quiz, Video lectures and Group discussion
II	a) Vegetative and reproductive morphology of living Pteridophytes b) General characters of the following orders: psilophytales, lcophytales, equsetales, polypodiales and marsileales. c) Stelar evolution – structure, development and evolution of sorus d) Heterospory and origin of seed habit - economic importance.	4 6 2 3	Chalk and talk PPT, LMS Quiz, Video lectures and Group discussion

III	a) Gymnosperms: General characters – origin of gymnosperms b) Classification by Sporne, 1965 c) Salient features of fossil gymnosperms- pteridospermales, bennettitales, pentoxylales, cycadales, cordaitales and coniferales.	3 5 7	Chalk and talk PPT, LMS Quiz, Video lectures and Group discussion
IV	a) General account, distribution, morphology, anatomy, reproduction and phylogeny of Cycadales b) Coniferales and gnetales c) Economic importance - woods of gymnosperms.	6 6 3	Chalk and talk PPT, LMS Quiz, Video lectures and Group discussion
V	a) Palaeobotany: Concepts of palaeobotany - geological time scale b) Fossillization- impressions, compressions, incrustation, casts, molds and petrifications – age determination and methods of study of fossils c) Carbon dating- role of fossils in oil exploration – palaeopalynology –Birbal Sahni's contributions.	5 5	Chalk and talk PPT, LMS Quiz, Video lectures and Group discussion

Course Designer: Dr. P. Kannan, Assistant Professor

PG Botany BluePrint

Test	10 marks	As per table below
Assignment	5 marks	K4
Seminar	5 marks	K4
Quiz	5 marks	K4

Learning Outcome Based Education (LOBE) & Assessment

Formative – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
1	CLO x	Up to K3	2	K2,K3	2 (K3&K3)	2 (K2,K3)
2	CLO y	Up to K4	3	K2, K2, K3	2 (K4&K4)	1 (K3/K4)
No. of Questions to be asked			5		4	3
No. of Questions to be answered			5		2	2
Marks for each question			2		5	10
Total Marks for each section			10		10	20

Learning Outcome Based Education (LOBE) & Assessment Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K2	2	K1 & K1	1	K1	2 (K1&K1)	1 (K2)
2	CLO 2	Up to K3	2	K2 & K3	1	K1	2 (K2&K2)	1 (K3)
3	CLO 3	Up to K4	2	K2 & K3	1	K2	2 (K3&K3)	1 (K3)
4	CLO 4	Up to K4	2	K3 & K4	1	K2	2 (K4&K4)	1 (K4)
5	CLO 5	Up to K4	2	K3 & K4	1	K3	2 (K4&K4)	1 (K4)
No. of Questions to be asked			10			5	10	5
No. of Questions to be			10			5	5	3
Marks for each question			1			2	5	10
Total Marks for each section			10			10	25	30

Distribution of Section- wise marks with K Levels in the summative examinations

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	**16**	13.33	**35%**
K2	2	4	10	10	**26**	21.66	
K3	4	2	10	20	**36**	30.00	**30%**
K4	2	-	20	20	**42**	35.00	**35%**
Total Marks	10	10	50	50	**120**	100.00	**100%**