SYLLABUS TEMPLATE

Semester: 2	
Course: Major 1	
Paper Title: Plant Diversity and Systematics	
Paper Code: C1BT230212T / C1BT230212P	**Credits: 4 (3 Th+1Pr)**
Hours/week: 6 Hours (T + P)	
Category: Core/MDC/SEC/VAC: Core (Major)	
Theory / Practical / Composite: Composite	
No of Modules: One	

Course Overview:

The course provides a foundational understanding of the plant kingdom, exploring evolutionary trends across algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. It emphasizes both the structural and functional attributes of plant groups and their evolutionary relationships. Students will examine plant morphology and classification principles, with exposure to classical, numerical, molecular, chemo- and serotaxonomy. In addition, cytogenetics is introduced to highlight the evolutionary significance of karyotype analysis and other molecular cytogenetic tools. Practical components strengthen conceptual knowledge through microscopic identification, cytological techniques, and hands-on exposure to plant morphology. The course fosters appreciation of plant diversity, economic and biotechnological applications, and equips students with theoretical and practical insights towards systematics and cytogenetic tools relevant for higher studies and research.

Course Outcome:

1. **Remember** the distinguishing features, pigments, and life cycle patterns of major plant groups including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms.
2. **Understand** the evolutionary relationships and structural complexities among plant groups and interpret their ecological and economic significance.
3. **Apply** plant morphological characters and cytological techniques (e.g., mitotic index estimation, meiotic studies) in the identification and classification of plants.
4. **Analyze** to compare and contrast various data sources used in classification (classical, molecular, numerical, chemo-, and serotaxonomy) and evaluate their relative merits in plant taxonomy.
5. **Evaluate** critically the evolutionary implications of plant cytogenetics and the application of molecular cytogenetic markers in understanding biodiversity.
6. **Create** and propose systematic approaches for identification and classification of plant taxa using traditional and modern tools by integrating knowledge of morphology, systematics, and cytogenetics.

Prerequisites: Basic Idea of Plant Biology

SYLLABUS				
THEORY				
UNIT/Module	**CONTENT**	**HOURS or NUMBER OF CLASSES**	**CO Mapping**	**COGNITIVE LEVEL**
I.	- Evolutionary trends in algae with reference to chloroplast ultrastructure, pigments, reproduction. - Evolutionary position of Fungi. Salient features of major groups of fungi. - Bryophytes, Pteridophytes and Gymnosperms - Evolutionary trends and lifecycle patterns. - Biotechnological and Economic importance of algae, fungi, bryophyte, pteridophyte and gymnosperms.	**10 Classes**	**CO 1 ; CO2**	**K1 to K4**
II.	- Important morphological peculiarities of root, phyllotaxy, inflorescences, flower characters and pollination syndromes. - Fundamentals of plant systematics and classification systems, Numerical taxonomy, Molecular taxonomy, chemotaxonomy and serotaxonomy. - Salient features of dicotyledons and monocotyledons (with examples). Use of image processing techniques for plant taxonomy.	**15 Classes**	**CO2, CO3, CO5**	**K1 to K4**
III.	- Evolutionary significance of Karyotype studies, symmetrical and asymmetrical karyotype. - Spectral karyotyping and uses of other molecular cytogenetic markers.	**4 Classes**	**CO3 to CO5**	**K3 to K6**
PRACTICAL				
	Identification of vegetative	**12**	**CO1 to**	**K1 to K6**

	and reproductive structures of algae, fungi, bryophytes and pteridophytes from temporary and permanent mounts. - Estimating the Mitotic index using the "Allium test". - Study of Different Meiotic stages from permanent mounts.	**Classes**	**CO6**	

Text Books
1. Botany Illustrated: Introduction to Plants, Major Groups, Flowering Plant Families; Janice Glimn-Lacy, Peter B. Kaufman; Springer
2. Plant Systematics, Michael J Simpson, Elsevier
3. Plant Cytogenetics: Genome Structure and Chromosome Function; James A. Birchler, Hank Bass (Edited); Springer-Verlag New York Inc.
Suggested readings
1. https://doi.org/10.3390/ijms26147013
2. https://doi.org/10.1016/j.compag.2025.110663
3. https://doi.org/10.1016/j.biosystems.2025.105444
Web Resources
1. https://efloraofindia.com/
2. https://www.kew.org/learning
3. https://bsi.gov.in/page/en/database-on-genome-related-information-of-indian-plants
Evaluation: Theory: CIA: 12 marks, Semester Exam: 45 marks, Attendance: 3 marks Practical (if applicable): CA: 30 marks Continuous Assessment, End Semester Viva: 8 marks, Attendance: 2 marks
Paper Structure for Theory Semester Exam Module: Paper Structure for Theory Semester Exam: Compulsory Objective Questions – 20 Marks [2 Marks each; Any 10 out of 12], 5 questions of 5 marks each – 25 Marks [Any 5 out of 6, with suitable subparts].

COURSE OUTCOMES (COS) AND COGNITIVE LEVEL MAPPING

COs	CO Description	Cognitive levels
CO1	Remember the details of the plant groups and their overall morphological and structural organization.	K1
CO2	Understand and acquire knowledge about complexity of plant groups and how they originated.	K2
CO3	Apply and gain an overview of angiosperm morphology in plants.	K3
CO4	Analyse the evolutionary implications of plant cytogenetics.	K4
CO5	Evaluate the common and transitory evolutionary	K5

	signatures across the plant kingdom with evidences from morphometry and other taxonomic data sources	
CO6	Apply and create meaningful insights using the practical observations and correlate them with the theoretical discourses.	K6