CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

BOTANICAL DIVERSITY

Programme	B. Sc. BOTANY				
Course Title	**Plant Diversity & Angiosperm Taxonomy**				
Type of Course	**Minor**				
Semester	**III**				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Higher secondary level Biology course				
Course Summary	This course covers a wide range of topics related to the classification and identification of plants. Students will learn about the diversity of plant species and the characteristics that define different plant groups. The course will also cover Taxonomy of Angiosperms and the methods and techniques used in it.				

Course Outcomes (CO): After completing the Course, the student should be able to:

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools
CO1	Explain the vegetative, reproductive and economic importance of Cyanobacteria, Algae and Fungi	U	F &P	Quiz/ Tests/ Lab Practical / Field Studies/ Assignments
CO2	Explain the vegetative, reproductive, ecological and economic importance of Bryophytes and Pteridophytes	U	F &P	Quiz/Test/ Assignments/ Lab Practical/ Field studies
CO3	Discus the vegetative, reproductive, ecological significance and economic importance of Gymnosperms	U	F & P	Lab Practical/ Field Work/ Assignments/ Quiz/Tests
CO4	Describe various classification systems and taxonomic principles to categorize and organize plant species.	U	F & P	Quiz/Test/ Assignments/ Lab Practical/ Field work
CO5	Appraise plant diversity and taxonomy in ecological and conservation contexts.	E	C	Lab practical/ Case Studies/ Field Studies/ Presentations

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus

Module	Unit	Content	Hrs (45 + 30)
I	**Cyanobacteria, Algae and Fungi**		**15**
	1	Cyanobacteria - General Account, Ecological and Economic importance.	2
	2	*Nostoc* - Structure, life cycle and ecological significance.	2
	3	Algae - General characteristics, Thallus organization & reproduction , Ecological and economic importance.	2
	4	*Spirogya* - Structure and life cycle.	2
	5	Fungi - General characteristics, Nutrition and reproduction. Economic and ecological significance of fungi.	2
	6	Morphology, reproduction and life cycle of *Agaricus* (developmental details not required)	2
	7	Symbiotic Associations - Lichens: General features, reproduction, ecological and economic importance.	2
	8	Mycorrhiza - General account and its significance.	1
II	**Bryophytes & Pteridophytes**		**8**
	9	Bryophytes - General characteristics, Thallus diversity, Ecology and economic importance.	2
	10	Morphology, anatomy and reproduction of *Riccia.*	2
	11	Pteridophytes - General account, Ecological and economical importance of Pteridophytes.	2
	12	Morphology, Anatomy and life cycle of *Pteris.*	2
III	**Gymnosperms**		**5**
	13	Gymnosperm - General account. Ecological and economic importance.	2
	14	Morphology, anatomy and reproduction of *Cycas.*	3
IV	**Angiosperms**		**17**
	15	Angiosperms - General characters, reproduction, life cycle pattern	2
	16	Nomenclature - Binomial system of nomenclature	2
	17	Basic rules of nomenclature	1
	18	Systems of classification - Bentham & Hooker's system	2
	19	Herbarium techniques: collection, drying, poisoning, mounting & labelling	2
	20	Significance of herbaria and botanical gardens	1

	21	Important herbaria and botanical gardens in India	1
	22	Study the following families and their economic importance: Fabaceae (with sub-families), Rubiaceae, Euphorbiaceae and Poaceae	6
V	**Practical (Mandatory experiments)**		**30**
	1. Microscopic observation of vegetative and reproductive structures of *Nostoc* and *Spirogyra.* 2. Make suitable micro preparations of vegetative and reproductive structures of *Agaricus, Riccia, Pteris* and *Cycas.* 3. Study of vegetative and floral characters of the families in the syllabus. Students shall be able to describe the plants in technical terms and draw the L.S. of two plants of the families and record the same. 4. Mounting of properly dried and pressed specimen of any five wild plants of the families mentioned in the syllabus, with proper herbarium label.		
Practical (Open Ended-Suggestive list)			
	5. Observation of algal diversity in ponds. 6. Field visit, identification and documentation of common Algae, Bryophytes and Pteridophytes. 7. Determine the systematic position of local plants comes under the syllabus based on their vegetative and floral characters. 8. Campus walk to identify and record campus plants.		

Suggested Readings

- Fritsch, F.E. 1935. The structure and reproduction of the algae. Vol. 1 and II, Uni. Press. Cambridge.
- Morris, I. 1967. An Introduction to the algae. Hutchinson and Co. London.
- Papenfuss, G.F. 1955. Classification of Algae.
- B.R. Vasishta. Introduction to Algae
- Mamatha Rao. 2009. Microbes and Non-flowering plants. Impact and applications. Ane Books, New Delhi.
- Sanders, W.B. 2001. Lichen interface between mycology and plant morphology, Bioscience, 51: 1025-1035.
- B.R. Vasishta. Introduction to Fungi.
- P.C. Vasishta. Introduction to Bryophytes.
- B.P. Pandey. Introduction to Pteridophytes
- Chamberlain C.J. 1935. Gymnosperms – Structure and Evolution, Chicago University Press.
- Sreevastava H.N. 1980. A Text Book of Gymnosperms. S. Chand and Co. Ltd., New Delhi.
- Vasishta P.C. 1980. Gymnosperms. S. Chand and Co., Ltd., New Delhi.
- Radford, A.E. 1986. Fundamentals of Plant Systematics. Harpor & Row Publishers, New York.
- Sivarajan, V.V. 1991. Introduction to Principles of Plant Taxonomy. Oxford & IBH,

New Delhi.

- Jeffrey, C. 1968. An introduction to Plant Taxonomy, Cambridge University Press, London.
- Gurucharan Singh. 2001. Plant Systematics. Theory and practice. Oxford & IBH Publications New Delhi.
- Sharma O.P. 1990. Plant Taxonomy – Tata McGraw Hills. Publishing company Ltd.
- Subramanyam N.S. 1999. Modern Plant Taxonomy. Vikas Publishing House Pvt Ltd.
- Pandey & Misra. 2008. Taxonomy of Angiosperms. Ane books Pvt Ltd.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	2	1	2	1	3
CO2	3	-	2	1	2	1	3
CO3	3	-	2	1	2	1	3
CO4	3	-	3	1	2	2	3
CO5	3	-	2	1	3	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Discussion
- Assignment/ Seminar
- Project/Practical
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment/Seminar	Practical/Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5			✓	✓

CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

AESTHETIC BOTANY

Programme	B. Sc. BOTANY				
Course Title	**Plant Anatomy & Analytical Techniques**				
Type of Course	**Minor**				
Semester	**III**				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Higher Secondary level Biology course				
Course Summary	This course explores the intricate structures and functions of plant anatomy and the organization of tissues within plants and its diversity. The course also deals with a variety of analytical techniques crucial for studying various branches in biological sciences.				

Course Outcomes (CO): After completing the Course, the student should be able to:-

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools
CO1	Explain the basics, scope and applications of plant anatomy	U	F & P	Instructor-created exams / Observation of practical skills
CO2	Describe the special features of plant anatomy and compare the normal and abnormal behaviour of cambium	U	F & P	Viva voce/ Practical Assignment
CO3	Explain the analytical skills and apply it for various lab practices	U	F & P	Observation of practical skills
CO4	Discuss various separation techniques and apply it in lab practices	U	F & P	Instructor-created exams
CO5	Access the role of plant anatomy and analytical techniques in various fields of science.	E	C	Lab practicals

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs (45 +30)
I	**Plant Anatomy -Basics, Scope and Applications**		**9**
	1	Introduction & Applications of plant anatomy in various fields	2
	2	Tissue systems - Simple & Complex, sclereids & fibres, Stomatal diversity	2
	3	Non-living inclusions of the cell & its applications	3
	4	Anatomical complexity in organization of shoot & root apex	2
II	**Special features in Plant Anatomy**		**12**
	5	Secondary thickening in dicot stem & root	2
	6	Anomalous secondary thickening - abnormal position and behaviour of cambium	2
	7	Anatomical diversity in major ecological groups of plants	3
	8	Wood anatomy - characteristics of wood & Types of wood	3
	9	Identification of various wood & defects in wood (shakes, knots, cross grain and stress defects)	2
III	**Analytical techniques**		**12**
	10	Solutions: representing concentrations: Molarity, Normality, Percentage and ppm	1
	11	Acids and bases, buffers and pH, measurement of pH	1
	12	Preparation and use of buffers in biological studies	1
	13	Microscopy – Introduction & Applications of Light microscopy	1
	14	Electron microscopy (SEM & TEM) - Principle, working & applications	2
	15	UV - Visible spectroscopy - Working and Applications	2
	16	IR spectroscopy - Applications	2
	17	Fluorescent spectroscopy - Principle & Applications	2
IV	**Separation techniques**		**12**
	18	Centrifugation - Basics, Principles behind various types & applications	2
	19	Differential, density gradient and Ultracentrifugation	2
	20	Chromatography - Introduction & Types	3
	21	Thin Layer Chromatography, Gas Chromatography & Liquid Chromatography - Principle and applications	3
	22	Mass spectroscopy - Basic principle and applications in plant science	2

V	Practical (Mandatory experiments)	30
	1. Normal secondary thickening in dicot stem and dicot root (any suitable material) 2. Anomalous secondary thickening of *Boerhaavia* and *Bignonia* 3. Special anatomical features of major ecological groups - any two plants depending on local availability (Hydrophytes, Xerophytes, Parasites) 4. Detection of different structures of plants - identification of starch grains, cystolith, raphides, any two types of sclereids and fibres 5. Stomatal types - identification	
	Practical (Open ended - Suggestive list)	
	6. Anatomical identification of commercial timber like (any two from the list - Teak, Rosewood, Artocarpus, Mahogany - Original specimen/ photographs and salient features) 7. Identification of types of wood and defects 8. Demonstration of the working of different kinds of centrifuges 9. Visit to a nearby analytical lab which facilitates the use of instruments mentioned in the syllabus and submission of report.	

Suggested Readings

- Esau, K. 1977. Anatomy of Seed Plants. John Wiley & Sons.
- Metcalfe, C. R., & Chalk, L. 1979. Anatomy of the Dicotyledons: Leaves, Stem, and Wood in Relation to Taxonomy with Notes on Economic Uses (Vol. 1). Oxford University Press.
- Raven, P. H., Evert, R. F., & Eichhorn, S. E. 2005. Biology of Plants (7th ed.). W.H. Freeman and Company.
- Mauseth, J. D. 2003. Botany: An Introduction to Plant Biology. Jones and Bartlett Publishers.
- Spectroscopic Techniques: Nakanishi, K., & Solomon, T. D. 1997. Infrared and Raman Spectra of Inorganic and Coordination Compounds. Wiley.
- Mass Spectrometry in Botany: Gross, J. H. 2011. Mass Spectrometry: A Textbook. Springer.
- Coutler E. G.1969. Plant Anatomy - Part I Cells and Tissues – Edward Arnold, London.
- Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA
- Eames A. J. Morphology of Angiosperms - Mc Graw Hill, New York.
- Evert, R.F. 2006. Esau‘s Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc
- Fahn, A. 1992. Plant Anatomy, Pergamon Press, USA
- Ruzin S.E. 1999. Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
- Webster J. G. 2004. Bioinstrumentation, John Wiley & Sons Inc.
- Narayanan P. 2000. Essentials of Biophysics, New Age Int. Pub. New Delhi.
- Hames G. G. 2005. Spectroscopy for the Biological Sciences, John Wiley & Sons Inc.

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	0	1	1	0	1	2
CO2	3	0	2	1	0	1	3
CO3	3	0	3	3	2	1	3
CO4	3	0	3	3	2	1	3
CO5	3	0	3	3	2	1	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Project/Practical
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical/Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓			✓
CO 5			✓	✓