UNIVERSITY OF CALICUT

BOTANICAL DIVERSITY

Programme	B. Sc. BOTANY				
Course Title	**Plant Ecology, Conservation & Plant Interactions**				
Type of Course	**Minor**				
Semester	**I**				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	-				
Course Summary	This course offers basic knowledge related to the relationships between plants and their environment, the importance of conservation efforts and the interactions between different plant species.				

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 ecological relationships between plants and the environment	U	C	Test/Assignments/Field study
CO2	Summarise the significance of conservation practices	U	F	Class Discussions
CO3	Explain various interactions that occur among plant species	U	C	Test/Field study/Group project
CO4	Develop the skills necessary to contribute to the conservation and sustainable management of plant ecosystems	Ap	C	Volunteer Projects/Reflective essays
CO5	Apply conservation strategies suitable for neighbouring ecosystems	Ap	P	Case studies/Presentations/Field reports

* - 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 Ecology**	**9**
	1	Ecology - Definition, Ecosystem: ecological factors - biotic and abiotic.	2
	2	Ecological adaptations - Morphological and anatomical adaptations of the following types: Hydrophyte (*Vallisnaria*), Xerophyte (*Opuntia*)	2
	3	Halophyte (*Avicennia*), Epiphytes (*Vanda*) and parasites (*Cuscuta*)	2
	4	Ecological succession - Process of succession, types of succession, Hydrosere	3
II		**Biodiversity, Loss and its Consequences**	**18**
	5	Biodiversity - Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity	3
	6	Values of Biodiversity - Economic and aesthetic value, Medicinal values	2
	7	Concept of Biodiversity Hotspots, Biodiversity hot spots of India.	2
	8	Concept of endemism and endemic species. ICUN plant categories with special reference to Western Ghats.	2
	9	Estimates of extinction rates worldwide and in India, causes of extinction/changes in biodiversity	2
	10	Habitat fragmentation and destruction	3
	11	Threats to biodiversity: Overexploitation, Invasive species	2
	12	Consequences: loss of gene pool, loss of ecosystem services, livelihood	2
III		**Biodiversity Conservation**	**8**
	13	Conservation methods - *In-situ* and *ex-situ* methods.	2
	14	*In-situ* methods - Biosphere reserves, National parks, Sanctuaries, Sacred grooves	2
	15	*Ex-situ* methods - Botanical gardens, Seed bank, Gene banks, Pollen banks	2
	16	Cryopreservation	2
IV		**Plant Interactions**	**10**
	17	Plant interactions: overview, Plant - microbe interactions: Mycorrhizae	1
	18	Plant - herbivore interactions, Plant defences against herbivores	2
	19	Plant - pollinator interactions, Pollination syndromes and floral specialisation	2
	20	Ant-plant interactions	1
	21	Plant-animal interactions as ecosystem services	2
	22	Conservation aspect of plant-animal interactions	2

V	Practical (Mandatory Experiments)	30
	1. Study the morphological and anatomical adaptations of the hydrophytes, xerophytes, halophytes, epiphytes and parasites mentioned in the syllabus 2. Study of a pond/forest ecosystem and recording the different biotic and abiotic components 3. Field observations of plant-animal interactions in natural environments around campus 4. Field visit: To study different types of local vegetation/ecosystems and the report to be recorded.	
	Practical (Open Ended-Suggestive list)	
	5. Case studies: Contemporary Indian wildlife and biodiversity issues 6. Group presentations in an area of conservation biology 7. Discussion on biodiversity (Man-animal conflict, human interference, climate change)	

Suggested Readings

- Rajak, A. 2020. Textbook of Biodiversity. 1st edition, Notion Press, India.
- Mahanty, S. and Srivastava, A. 2016. Biodiversity and It's Conservation. Disha International Publishing House, India.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2008. Ecology, Environment and Resource Conservation. Anamaya Publications (New Delhi).
- Krishnamurthy, K.V. 2004. An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
- Gaston, K J. and Spicer, J. I. 1998. Biodiversity: An Introduction. Blackwell Science, London, UK.
- Primack, R. B. 2002. Essentials of Conservation Biology (3rd edition). Sinauer Associates, Sunderland, USA.
- Chittka, L. and Thompson, J. D. (Eds.). 2001. Cognitive Ecology of Pollination- Animal Behaviour and Floral Evolution. Cambridge University Press.
- Herrera, C. M. and Pellmyr, O. (Eds.). 2002. Plant-Animal Interactions: An Evolutionary Approach. Blackwell Publishing.
- Schaeffer, H.M., and Ruxton, G.D. (Eds). 2011. Plant-Animal Communication. Oxford University Press.

Online Sources

- https://www.igntu.ac.in/eContent/IGNTU-eContent-313628797582-M.Sc-EnvironmentalScience-4-ManojkumarRai-MicrobialEcology-2-3.pdf
- http://www.eagri.org/eagri50/AMBE101/lec29.html
- http://eagri.org/eagri50/AMBE101/pdf/lec29.pdf
- ales.arizona.edu/classes/ento415/LECTURES/ENTO415_PlantInteractions.pdf
- https://entnemdept.ufl.edu/baldwin/webbugs/3005_5006/Docs/notes/notes10.pdf

Mapping of COs with POs:

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

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	✓		✓	

UNIVERSITY OF CALICUT

Programme	B. Sc. BOTANY				
Course Title	**Plant Morphology, Physiology & Plant Resources**				
Type of Course	**Minor**				
Semester	**II**				
Academic Level	100-199				
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 comprehensive study of the structure, function, and utilization of plants. Students will explore the morphology of plants, and the physiological processes that occur within plants. Furthermore, students will learn about the diverse uses of plants as valuable resources for food, medicine, and more.				

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 various morphological characteristics of a plant	U	F	Quiz/ Test/Assignments/ Practical/ Field studies
CO2	Identify the physiological processes that drive plant growth, development and responses to the environment	Ap	C	Assignments/Quiz/Test
CO3	Apply knowledge of plant morphology and physiology to analyse and solve real-world problems related to plant health and productivity	Ap	C & P	Field Work/Presentations
CO4	Evaluate the importance of plants as valuable resources for food, medicine and more	E	C	Group project/Class discussion

* - 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 Morphology**	**7**
	1	Morphology of leaf; Structure, simple, compound, venation and phyllotaxy.	2
	2	Inflorescence - Racemose, cymose, special, types with examples	2
	3	Flower - as a modified shoot, structure of flower, symmetry of flower, floral parts - their arrangement, types of aestivation, relative position of parts, cohesion and adhesion of stamens and placentation.	3
II		**Plant Physiology**	**18**
	4	Water relations: Permeability, Imbibition, Diffusion, Osmosis and water potential.	2
	5	Absorption of water: passive mechanism.	1
	6	Ascent of sap: Transpiration pull or cohesion-tension theory.	2
	7	Transpiration: Types, mechanism of stomatal movement: K^+ ion theory.	2
	8	Significance of transpiration, antitranspirants.	2
	9	Photosynthesis: Introduction, significance, Two pigment systems, red drop, Emerson enhancement effect, action and absorption spectra.	3
	10	Mechanism of photosynthesis: Light reaction, cyclic & non-cyclic photo phosphorylation, Dark reactions-Calvin cycle, C_4 cycle, photorespiration (a brief account only). Factors affecting photosynthesis.	6
III		**Plant Growth**	**10**
	11	Plant growth - Definition, phases of growth, Auxins, gibberellins, cytokinin, abscisic acid and ethylene, their physiological roles.	2
	12	Senescence and abscission.	2
	13	Photo-periodism and vernalization.	2
	14	Dormancy of seeds - Factors causing dormancy, photoblasticism, techniques to break dormancy.	2
	15	Physiology of fruit ripening.	2
IV		**Plant Resources**	**10**
	16	Brief account on the various categories of plants based on their economic importance	1
	17	Study the following plants with special reference to their binomial, family, morphology of the useful part and their uses. Cereals: Paddy, Wheat; Pulses: Black gram, Green gram; Oil: Coconut, Gingelly	3

	18	Fibre: Cotton; Latex: Rubber; Beverages: Tea, Coffee	2
	19	Spices: Pepper, Cardamom, Clove	2
	20	Medicinal plants: *Rauvolfia serpentina*, *Justicia adhatoda*, *Santalum album and Curcuma longa.*	2
V	**Practical (Mandatory experiments)**		**30**
	4. Identify the types of inflorescences mentioned in the syllabus. 5. Learn the principle and working of the following apparatus/experiments ▪ Thistle funnel osmoscope ▪ Ganong's potometer ▪ Ganong's light-screen ▪ Absorbo transpirometer ▪ Mohl's half-leaf experiment ▪ Experiment to show evolution of O_2 during photosynthesis 6. Identify at sight the economically important plant produces and products mentioned in module IV, and learn the binomial and family of the source plants, morphology of the useful parts and uses		
Practical (Open ended)			

Suggested Readings

- Sporne K. R. 1974. Morphology of Angiosperms. Hutchinson.
- William G. Hopkins. 1999. Introduction to Plant Physiology, 2nd edition, John Wiley & Sons, Inc.
- Frank B. Salisbury and Cleon W. Ross. 2002. Plant Physiology 3rd edition. CBS publishers and distributers.
- G. Ray Noggle and George J. Fritz. 1983. Introductory Plant Physiology Prentice Hall.
- Pandey B. P. 1987. Economic Botany
- Verma V. 1984. Economic Botany
- Hill A.W. 1981. Economic Botany, McGraw Hill Pub
- Alam, Afroz. 2020. A Textbook of Economic Botany and Ethnobotany. IK International Publishing House.
- Atal C.K. and Kapur B. M. 1982. Cultivation and Utilization of Medicinal Plants. CSIR-RRL, Jammu.
- Sambamurty and Subrahmanyam, N. S. 2008. A Textbook of Modern Economic Botany. CBS Publishers & Distributors Pvt. Ltd.
- Bhutya, R. K. 2021. Medicinal Plants of India Vol. I & II. Scientific Publishers.

Mapping of COs with POs:

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

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	✓			

UNIVERSITY OF CALICUT

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	Identify wide range of plant species based on their morphological characteristics.	U	F	Quiz/ Tests/ Lab Practical / Field Studies/ Assignments
CO2	Understand the evolutionary relationships between different plant groups.	U	C	Quiz/Test/ Assignments/ Lab Practical/ Class Discussions
CO3	Demonstrate proficiency in using various tools to identify unknown plant specimens.	U	C & P	Lab Practical/ Field Work/ Assignments/ Quiz/Tests
CO4	Apply various classification systems and taxonomic principles to categorize and organize plant species.	Ap	P	Quiz/Test/ Assignments/ Lab Practical/ Projects
CO5	Appraise plant diversity and taxonomy in ecological and conservation contexts.	E	C	Essays/ 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	2	-	-	-	1	1	-
CO2	2	-	-	-	1	1	-
CO3	2	-	-	1	1	1	-
CO4	1	-	1	-	1	1	1
CO5	2	-	-	-	1	1	-

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				✓