



University of Kerala

Discipline	BOTANY				
Course Code	UK1MDCBOT103				
Course Title	BOTANY IN FORENSIC SCIENCE				
Type of Course	MDC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	03	02 Hours	-	02 Hours	04 Hours
Pre-requisites	No Pre-requisites				
Course Summary	Forensic botany is an integration of botany and forensics. The botanical aspect is primarily associated with the anatomy and taxonomy that helps to identify particular plant species. The forensic aspect deals with recognizing plant-based evidence at the crime scene, its collection, and proper processing to be admissible in a court of law.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		Introduction	01
	1	Forensic botany- Introduction and its importance	
II		Branches of Botany in Forensic Study	02
	2	Branches of Botany in Forensic Study: morphology, anatomy, palynology, dendrochronology, algology, limnology, mycology, plant systematics, Plant Molecular Biology and ecology, and applications. The Lindbergh Case.	
II		Botanical evidences	05
	3	Plant evidence collection, analysis, and documentation - Types of plants (General plant classification schemes) Algae, Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms. Non-plant groups - Fungi and lichens.	
	4	Basic plant characteristics for the forensic investigator. Plant architecture- roots, stems, leaves, flowers, and fruits. Plant dispersal. Practical plant classification schemes: - vegetables and herbs, fruits bearing trees, landscaping plants: trees, shrubs and vines, grasses.	
III		Analyses of Samples	06
	5	Plant anatomy- cell structure and functions. Basic plant tissues (a very brief overview only).	
	6	Microscopy in Forensic botany: uses and applications - hand lens, compound microscope, stereo microscope, scanning electron microscope. (Working, principles are not required).	
	7	Various types of woods and timbers (a brief overview). Identification of wood-physical properties: color, fluorescence, hardness, weight, odour, lustre, texture, anatomical features, pore/vessel distribution,	

		size and arrangement, pore numbers, pore arrangements, inclusions, coloured deposits.	
	8	Types of fibers- man-made and natural fibers. Forensic aspects of fiber examination- fluorescent, optical properties, refractive index, birefringence, dye analysis.	
	9	Identification of starch grains, powder, and stains of spices.	
	10	Paper and Paper Pulp identification, Microscopic and biochemical examination of pulp material.	
	11	Forensic palynology: Study and identification of pollen grains. Case study: War crimes investigations by International Criminal Tribunal for the former Yugoslavia.	
VI	Algae in forensic science		04
	12	Algal diversity (brief outline). Forensic Limnology: Methods of identification and comparison of various types of Planktons and diatoms and their forensic importance. Diatoms types and morphology. Extraction methods. Diatom testing. Case study: State of Connecticut (USA) vs. John C. Hoepfner	
	13	Forensic mycology- a general account. Fungi as agents of poisoning and hallucinations	
V	Poisonous plants and their toxins		12
	14	Study of Various types of poisonous plants- <i>Abrus precatorius</i> , <i>Anacardium occidentale</i> , <i>Argemone mexicana</i> , <i>Calotropis</i> , <i>Cannabis sativa</i> , <i>Cinchona</i> , <i>Croton tiglium</i> , <i>Atropa belladonna</i> , <i>Gloriosa superba</i> , <i>Jatropha curcas</i> , <i>Lathyrus sativus</i> , <i>Manihot utilissima</i> , <i>Nerium indicum</i> , <i>Nicotiana tabacum</i> , <i>Plumbago</i> , <i>Ricinus communis</i> , <i>Semicarpus anacardium</i> , <i>Strychnos nux-vomica</i> , <i>Thevetia nerifolia</i> , <i>Cerbera odollum</i> .	
	15	Types of plants yielding drugs of abuse – Opium, <i>Cannabis</i> , <i>Coco</i> , <i>Tobacco</i> , <i>Datura</i>	
	16	How to become a forensic botanist?	

Practicals		
	<ol style="list-style-type: none"> 1. Conduct a visit to a natural place and identify plant and non-plant groups mentioned in the syllabus. 2. Documentation of forensic evidence through photographs and charts. 3. Light microscopic examination of different paper samples. 4. Examine the physical properties and anatomical differences of common wood types in Kerala (any three). 5. Microscopic examination of natural and manmade fibers. 6. Study of poisonous plants mentioned in the syllabus. 7. Visit an aquatic ecosystem and identify diatoms by microscopic examination. 8. Microscopic examination of pollen grains and spores 9. Identify appropriate case studies using botanical evidence from literature (other than mentioned in the syllabus) and document (at least five cases) 	30

Suggested Readings

1. Gibson, David J. 2022. *Planting Clues: How plants solve crimes*. Oxford University Press,
2. Bock, Jane H., and David O. Norris. 2015. *Forensic plant science*. Academic Press,
3. Hall, David W., and Jason Byrd. 2012. *Forensic botany: a practical guide*. John Wiley & Sons,
4. Coyle, Heather Miller. 2004. *Forensic botany: principles and applications to criminal casework*. CRC press,
5. Hesse, Halbritter, Heidemarie. 2009. *Illustrated pollen terminology*. Springer.

References

1. Breeze, 2005. "Microbial forensics." *Microbial forensics*. Academic Press.
2. Caccianiga, Marco, et al. 2021 "Common and much less common scenarios in which botany is crucial for forensic pathologists and anthropologists: a series of eight case studies." *International Journal of Legal Medicine* 135:1067-1077.
3. Tranchida et al., 2020. The use of fungi in forensic science, a brief overview. *Canadian society of forensic science journal*, 54(2):1-14
4. Bateman, Nick, and others (eds). 2014. *Oxford Desk Reference: Toxicology*, Oxford Desk Reference Series (Oxford; online edn.)

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Evaluate the nature of plant-based evidence	R, U	PSO-1,2
CO-2	Observe how plant-based evidence has been used in forensic investigations.	R, U	PSO-4
CO-3	Apply logical analysis of plant-based evidence to crime solving	Ap	PSO-4
CO-4	Describe the techniques used to identify and evaluate plant-based evidence including microscopy	R, U	PSO-6
CO-5	Identify and able to name sources for poisonous plants and fungi	R	PSO-1
CO-6	Master an appropriate range of knowledge on plant structure including morphology, wood anatomy, palynology	R, U, Ap	PSO-2

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

Name of the Course: Botany in Forensic Science**Credits: 2:0:1 (Lecture:Tutorial:Practical)**

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	1		R, U	F	L, T	
CO-2	2		R, U	F	L	
CO-3	3		Ap	C	L	P
CO-4	4		R, U	F, C		P
CO-5	5		R	C	L	P
CO-6	6		R, U, Ap	M	T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	