

Semester 2: Elective courses

E1: Systematic Biology

Instructors: **R. Ganesan, G. Ravikanth and N.A. Aravind**

Number of credits - 3

Course description: The course is designed with the objective of introducing students to Systematic Biology and its contribution to Biodiversity conservation. Course will contain such topics as origin of Systematic Biology - more of herbal science passing through bio prospecting in medieval time and heading towards evolutionary aspects of biodiversity incorporating conservation science. As an outcome of the course, the students will be trained to a) identify plants in the field and in herbarium and b) strengthen their understanding of biodiversity conservation with insights from systematic biology.

The course will cover four components: 1) Practicing plant taxonomy 2) Codes of biological nomenclature, 3) Molecular systematics, 4) Legislation regulating biological collections, trade etc.

I. Practicing Plant Taxonomy (Ganesan and Aravind)

Theory (lectures):

1. Evolution of Systematic biology and its relevance to the modern society and biodiversity conservation
2. Systematics – a tool to conserve biodiversity
3. Origin, history and relevance of taxonomy
4. Practicing Plant taxonomy
 - Morphology of plant parts
 - Morphological features (thumb rules) to identify some plant taxa
5. Learning taxonomy (“feeling” the plants in the field. This part of the course is to expose the participants about the basics of plant morphology, modifications / specializations of plant parts)
6. Divergence and convergence of morphological features – basics to learn about relationship among the closely related plants- reasons to appreciate the similarities and dissimilarities leading to distinguishing the species – speciation, splitting and lumping of taxa
7. Method of plant collection for herbarium, carpological material in the field; photo documentation of diversity
8. Documenting biodiversity to conserve – Herbarium, digital herbarium (method of plant collection for herbarium, carpological material in the field, photo documentation etc)
9. Databases, cyber taxonomy
10. Species distribution models
11. Citizen science in taxonomy

II. Codes of biological nomenclature (Ganesan and Aravind)

1. Biological Species concepts
2. Codes of Nomenclature (ICZN and ICBN) –animals and plants

III. Molecular systematics (Ravikanth)

1. Phylogenetics in systematic biology
2. DNA barcoding
3. Practical in molecular systematics:
 - a. Isolation of DNA from plant and animal tissues;
 - b. PCR techniques
 - c. sequencing and analyzing the data

IV. Legislation regulating biological collections, trade etc. (Aravind and Ganesan)

1. Biodiversity Act,
2. Intellectual Property Right and Regulations on biological material collection and sharing

Notes:

Participants will not be taught botanical name in the field, rather encouraged to do observation, noting them in the Field Note Book so that they on their own by using Flora will identify the plant specimen they “felt” in the field. Students will be learning taxonomy by dissecting the plant collections and using flora, wading through Keys etc; Students will be asked to individually collect 2-3 plant species in the field and taking notes about them. The same day they will be taught to identify the plants by using keys given in the local flora. Documenting diversity by preparing herbarium- Each student will be asked to prepare herbarium of the plants they identified and submit to ATREE Herbarium.

Assignment- product out of the field work – in the form of developing Identification keys, Photo documentation of morphological features of a group of plants, Writing mini-flora, ethnobotanical knowledge documentation, etc.

Seven days of Field Course is part of the Elective course. Field Course will be based in one of the Field Academy cum Community Conservation Centres

Session-wise time table

(Wednesdays – 11:00-11:50am, Fridays - 11:00-11:50am and Lab on Thursdays (2:00-5:00pm))

Month	Date	Day	Topic	Instructor
January	8	Wed	Introduction	Ganesan
	9	Thru	Introduction contd..	Ravikanth
	10	Fri	Biosystematics, Taxonomy and Species concepts	Aravind
	16	Thru	Biosystematics and Biogeography	Aravind
	17	Fri	Types and collections	Aravind
	22	Wed	Taxonomic errors and its implications	Aravind
	23	Thru	Tools in Biosystematics-General	Aravind
	24	Fri	Tools in Biosystematics - Numerical	Aravind/Ravikanth
	29	Wed	Web tools and Cyber Taxonomy	Ravikanth
	30	Thru	Databases and Biosystematics	Aravind
	31	Fri	Citizen science and Biosystematics	Aravind
February	5	Wed	Molecular Taxonomy (Theory)	Ravikanth
	6	Thru	Molecular Taxonomy (Theory)	Ravikanth
	7	Fri	Molecular Taxonomy (Theory)	Ravikanth
	12	Wed	Molecular Taxonomy	Ravikanth
	13	Thru	Molecular Taxonomy (Lab)	Ravikanth
	14	Fri	Molecular Taxonomy	Ravikanth
	19	Wed	Molecular Taxonomy	Ravikanth
	20	Thru	Molecular Taxonomy (Lab)	Ravikanth
	21	Fri	Molecular Taxonomy	Ravikanth
March	5	Wed	Phylogeny	Ravikanth
	6	Thru	Phylogeography	Ravikanth
	7	Fri	Taxonomy and Interdisciplinary Research (Guest Lecture)	Priyan
	12	Wed	Nomenclatures: IBCN and ICZN	Aravind
	13	Thru	Taxonomy and Conservation	Aravind
	14	Fri	Biodiversity law and International Convention	Aravind
	20	Thru	Numerical Taxonomy (Lab)	Ravikanth, Ganesan and Aravind
	21	Fri	Biodiversity law and International Convention	Aravind
	27	Thru	Documentation for Biosystematic research	Ganesan and Aravind
	28	Fri	Documentation for Biosystematic research	Ganesan and Aravind
April	3	Thu	Documentation for Biosystematic research	Ganesan and Aravind
	9	Wed	Plant taxonomy – evolution over time	Ganesan
	10	Thru	Systematics – a tool to conserve biodiversity	Ganesan

	11	Fri	Plant Morphology – Stem	Ganesan
	16	Wed	Plant Morphology – leaf lecture	Ganesan
	17	Thru	Plant morphology – leaf practical	Ganesan
	18	Fri	Plant morphology- flower (lecture & practical)	Ganesan
	23	Wed	Plant morphology- fruits and seeds (lecture & practical)	Ganesan
	24	Thru	Major plant families of S. India	Ganesan
	25	Fri	Flora and keys	Ganesan
May	2	Wed	Documenting plant diversity- herbarium-practical	Ganesan
May	12-18		Field visit (KMTR) seven days Exclusively in the field	Ganesan

Field visit will involve observing the plants in the field, learning about morphology, collection, using flora to identify the plant, writing description, developing keys and preparing herbarium. The later part in the field is compulsory and has more linkage with the class room and lab based activities.

Assessment scheme

Class Participation: 10%

Plant taxonomy field exercise and herbarium: 40%

Molecular tools lab exercise: 30%

Assignment

A) Documentation: 10%

B) Biodiversity Law: 10%