

## **C1A: Ecology**

---

**Instructors:** T. Ganesh (co-ordinator; [tganesh@atree.org](mailto:tganesh@atree.org)), Abi Tamim Vanak ([avanak@atree.org](mailto:avanak@atree.org)), G. Ravikanth ([gravikanth@atree.org](mailto:gravikanth@atree.org)) and Ankila Hiremath ([hiremath@atree.org](mailto:hiremath@atree.org))

**Credits and contact hours:** 3 credits, 48 hours

**Class schedule:** Monday, Wednesday and Friday (10:00 – 10:50 AM)

**Course exemption test:** 12<sup>th</sup> August 2013 (2:00-3:00PM)

### **Course Description:**

This course is primarily designed for students with a background in the social sciences, or students from the natural sciences who have had no prior training in ecology. This introductory full semester core course will introduce students to basic principles in ecology with emphasis on its application. Students will learn about ecological concepts that apply at levels of the population, community and ecosystem: the relationship between organisms and their environment, interactions amongst organisms; patterns in the distribution of species and communities; and processes that underlie the functioning of ecosystems. The course will also draw upon case studies to illustrate the application of ecological concepts to conservation and sustainable use of resources. The course will also have special lectures and discussions on ecology and conservation.

In addition to imparting an understanding of how ecologists think, the course will also foster students' skills in learning to read and think critically, and to understand and interpret how information is presented graphically.

### **Course evaluation:**

There will be 2 brief assignments assigned during this course and one longer assignment based on project work evaluated at the end of the course.

The Final examination at the end of the semester will count for 50% of the marks;

The 2 short assignments will each count for 10% of the marks and the longer 20%;

Class participation and attendance will count for the remaining 10% of the marks.

### **Course schedule**

| Sl | Date                          | Day | Module       | Lecture   | Instructors |
|----|-------------------------------|-----|--------------|---|-------------|
| 1. | 12/8/13<br>(10:00 – 10:50 AM) | Mon | Introduction | Introduction to Ecology: Its history, evolution from natural history and relevance in a human dominated world. Introduction to the idea of scales/and levels of organization. | TG          |

|     |                               |     |                    |  |     |
|-----|-------------------------------|-----|--------------------|--|-----|
| 2.  | 14/8/13<br>(10:00 – 10:50 AM) | Wed |                    | The physical environment (soil, water, temperature)  | TG  |
| 3.  | 16/8/13<br>(10:00 – 10:50 AM) | Fri |                    | Adaptations to the physical environment, drought and salt tolerance, C3/C4 species   | TG  |
| 4.  | 19/8/13<br>(10:00 – 10:50 AM) | Mon |                    | Photosynthesis and climate   | TG  |
| 5.  | 21/8/13<br>(10:00 – 10:50 AM) | Wed |                    | <b>[Lab]</b> C3, C4 and CAM photosynthesis and respiration measurements using Infra Red Gas Analyser (IRGA)<br><br>How gas absorption by plants is measured. | GR  |
| 6.  | 23/8/13<br>(10:00 – 10:50 AM) | Fri |                    | Application: Elevated Co2 and plant response   | TG  |
| 7.  | 26/8/13<br>(10:00 – 10:50 AM) | Mon | Evolution          | Natural Selection and Evolution  | TG  |
| 8.  | 28/8/13<br>(10:00 – 10:50 AM) | Wed |                    | Speciation, sexual selection and evolution, taxonomy and systematics   | TG  |
| 9.  | 30/8/13<br>(10:00 – 10:50 AM) | Fri |                    | Application: Something on the relevance of taxonomy/systematics to conservation perhaps?   | TG  |
| 10. | 2/9/13<br>(10:00 – 10:50 AM)  | Mon | Community ecology  | Introduction to community ecology: What is an ecological community, inter and intra specific competition, ecotones etc.                                      | TG  |
| 11. | 4/9/13<br>(10:00 – 10:50 AM)  | Wed |                    | Food webs, bottom-up and top-down control  | TG  |
| 12. | 6/9/13<br>(10:00 – 10:50 AM)  | Fri |                    | Interspecific competition: density dependent mortality, population regulation  | TG  |
| 13. | 11/9/13<br>(10:00 – 10:50 AM) | Wed |                    | Mutualistic interactions : pollination dispersal, predation  | TG  |
| 14. | 13/9/13<br>(10:00 – 10:50 AM) | Fri |                    | Application: Species interactions and its relevance to Agricultural and agroforestry systems   | TG  |
| 15. | 16/9/13<br>(10:00 – 10:50 AM) | Mon |                    | Community building/Succession - open & closed communities - Clementsian & Gleesonian   | TG  |
|     | (2:00-5:00pm)                 |     |                    | <b>[Lab]</b> Community ecology   |     |
| 16. | 18/9/13<br>(10:00 – 10:50 AM) | Wed |                    | Disturbance, gap dynamics  | TG  |
| 17. | 20/9/13<br>(10:00 – 10:50 AM) | Fri |                    | Application: Paper discussion (Implications of non-equilibrium dynamics to management)   | TG  |
| 18. | 23/9/13<br>(10:00 – 10:50 AM) | Mon | Population ecology | Introduction to population ecology: What is a population? Terms. Population estimation   | ATV |
| 19. | 25/9/13<br>(10:00 – 10:50 AM) | Wed |                    | Population processes. Life tables and matrix models. Generalizing about populations: Survivorship curves.  | ATV |
| 20. | 27/9/13<br>(10:00 – 10:50 AM) | Fri |                    | Models of population growth: exponential and logistic growth. Carrying capacity and r- and K- life-histories.  | ATV |
| 21. | 30/9/13<br>(10:00 – 10:50 AM) | Mon |                    | Temporal and spatial patterns in the dynamics of populations: Biotic and abiotic factors, density dependent vs density independent controls.                 | ATV |
|     | (2:00-5:00pm)                 |     |                    | <b>[Lab]</b> Population ecology  |     |
| 22. | 7/10/13<br>(10:00 – 10:50 AM) | Mon |                    | Dispersal, patches and metapopulations. Movement ecology   | ATV |

|     |                                |     |  |   |     |
|-----|--------------------------------|-----|--|---|-----|
| 23. | 9/10/13<br>(10:00 – 10:50 AM)  | Wed |  | Models in Ecology: deterministic VS non deterministic.  | ATV |
| 24. | 11/10/13<br>(10:00 – 10:50 AM) | Fri |  | Application: Dynamics of an endangered population: the case of the Island fox   | ATV |
| 25. | 16/10/13<br>(10:00 – 10:50 AM) | Wed |  | An introduction to population genetics. Population genetics and its conservation implications (e.g., inbreeding depression and genetic drift; minimum viable population size). [GR]               | GR  |
| 26. | 18/10/13<br>(10:00 – 10:50 AM) | Fri |  | Application: Impacts of disturbance/harvesting on Genetic diversity. Examples in plants. Impacts of selecting hunting on the genetic pool. Conservation issues: Genetic rescue/genetic enrichment | GR  |
| 27. | 21/10/13<br>(10:00 – 10:50 AM) | Mon | Ecosystem ecology                            | Introduction to the ecosystem concept. Energy and matter in ecosystems: net and gross production. Measuring biomass and productivity.   | AJH |
| 28. | 23/10/13<br>(10:00 – 10:50 AM) | Wed |  | Cycling of nutrients through terrestrial ecosystems.  | AJH |
| 29. | 25/10/13<br>(10:00 – 10:50 AM) | Fri |  | Application: Productivity and nutrient cycling paper discussion on global change and impacts on nutrient cycles   | AJH |
| 30. | 28/10/13<br>(10:00 – 10:50 AM) | Mon |  | Biodiversity and ecosystem functioning. Ecosystem stability & resilience  | AJH |
| 31. | 30/10/13<br>(10:00 – 10:50 AM) | Wed |  | Biomes & climate.   | AJH |
| 32. | 6/11/13<br>(10:00 – 10:50 AM)  | Wed |  | Ecosystems of India - humid tropical forests  | AJH |
| 33. | 8/11/13<br>(10:00 – 10:50 AM)  | Fri |  | Ecosystems of India - tropical montane forests and sholas   | AJH |
| 34. | 11/11/13<br>(10:00 – 10:50 AM) | Mon |  | Ecosystems of India - dry deciduous forests   | AJH |
| 35. | 13/11/13<br>(10:00 – 10:50 AM) | Wed |  | Ecosystems of India - savannas and grasslands   | AJH |
| 36. | 15/11/13<br>(10:00 – 10:50 AM) | Fri |  | Ecosystems of India - temperate coniferous and broadleaved forests  | AJH |
| 37. | 18/11/13<br>(10:00 – 10:50 AM) | Mon |  | Ecosystems of India - alpine meadows  | AJH |
| 38. | 20/11/13<br>(10:00 – 10:50 AM) | Wed | Conservation Biology and sustainable science | Biodiversity - measures, patterns at continental & global scales  | AJH |
| 39. | 22/11/13<br>(10:00 – 10:50 AM) | Fri |  | Biodiversity and Humans: species extinction, overexploitation, invasive species, global warming   | AJH |
| 40. | 25/11/13<br>(10:00 – 10:50 AM) | Mon |  | Conservation of species and populations - applied population ecology, sustainable harvest models  | ATV |
| 41. | 27/11/13<br>(10:00 – 10:50 AM) | Wed |  | Conservation of communities and ecosystems - applied community & ecosystems ecology   | TG  |
| 42. | 29/11/13<br>(10:00 – 10:50 AM) | Fri |  | Landscape fragmentation and species conservation: protected area  | ATV |
| 43. | 2/12/13<br>(10:00 – 10:50 AM)  | Mon |  | Human-Wildlife conflict: the science of conflict  | ATV |
| 44. | 4/12/13<br>(10:00 – 10:50 AM)  | Wed |  | Conservation planning – prioritization, zoning.   | ATV |

|     |   |     |  |   |  |
|-----|---|-----|--|---|--|
| 45. | 6/12/13<br>(10:00 – 10:50 AM)                           | Fri |  | Concluding session: group presentation of work done during the semester.* |  |
|     | <b>16<sup>th</sup> Dec</b><br><b>(10:00am – 1:00pm)</b> |     |  | Final exam  |  |

Note: ATV: Abi Tamim Vanak; AJH = Ankila Hiremath; GR = G. Ravikanth; TG = T. Ganesh; \* We will assign projects to students that can be done over the semester and presented at the end.

### **Textbooks:**

*The Economy of Nature-Robert Ricklefs. (6 ed.) 2010.*

*Ecology: Individuals to Ecosystems: Begon, Townsend and Harper (4 ed.) 2006.*

*Conservation Biology: A Primer for South Asia. Bawa, K.S. Richard Primack and Meera Oommen. 2010.*