



EC 204 Jan 2:1

Evolutionary Biology

Instructor

Praveen Karanth and Kartik Sunagar
Email: karanth@iisc.ac.in AND ksunagar@iisc.ac.in

Teaching Assistant

Chinta Sidharthan AND Shamik Roy
Email: chintas@iisc.ac.in AND shamikroy@iisc.ac.in

Department: Centre for Ecological Sciences

Course Time: Tue., Thus., 11:00 - 12:30

Lecture venue: CES Classroom and the computer lab

Detailed Course Page: <http://ces.iisc.ac.in/new/?q=courses#C11>

Announcements

Brief description of the course

This course offers an in-depth, hands-on look at the basic principles of evolutionary biology, and discusses the recent advancements and the major ideas in the field. The course has a special emphasis on phylogenetics, population genetics and molecular evolution, and offers exposure to a wide range of theoretical and practical aspects for understanding the micro- and macroevolutionary processes that shape the diversity of life on earth.

The course is open only to MS, Int-PhD and PhD students.

Prerequisites

UB 206 Basic Molecular Biology, UB305L Genetics (for BS-MS students)

Syllabus

Basic Mendelian genetics; Natural selection; units of selection; adaptation; speciation; population genetics; drift and the neutral theory; quantitative genetics; molecular phylogenetics; molecular evolution; estimating nucleotide substitutions; homologous sequences; gene trees vs. species trees; Darwinian selection at the molecular level; gene family evolution; applications of molecular phylogenetics; evolution and medicine.

Course outcomes

At the end of this course, we expect the student to have a better understanding of the different evolutionary processes that shape biodiversity. The course also addresses microevolutionary processes using quantitative genetics at the molecular level. In the practical section of the course, the students will learn how to use analytical tools to construct and interpret phylogenetic trees from molecular data and understand the evolutionary diversification of gene/protein families.

Grading policy

Assignments: 30%

Mid-term examinations: 70%

Assignments

The students are required to reconstruct a phylogeny based on a published dataset (selected from a specified journal) consisting of one nuclear and one mitochondrial marker. The software Mega is used for sequence alignment and analysis. The students are required to come up with their own interpretations from their reconstructed phylogenies. In the second assignment, they will evaluate the molecular evolution of gene families and map the evolutionary variability on the 3D structures of proteins. This will be followed by the discussions on the evolutionary process that shape proteins at the molecular-level.

Resources

Evolutionary biology

Douglas J. Futuyma (1998)

3rd Sinauer Associates Inc, Publishers, Sunderland

Evolutionary Analysis, Fifth Edition

by Jon Herron Scott Freeman

Principles of Population Genetics

Hartl D. L. and Clark A. G

3rd Edition

Sinauer Associates Inc, Publishers, Sunderland