

Syllabus for Ecology and Evolution (EY)

Ecology: Population ecology; metapopulation dynamics; growth rates; density independent growth; density dependent growth; niche concept; Species interactions: Plant-animal interactions; mutualism, commensalism, competition and predation; trophic interactions; functional ecology; ecophysiology; behavioural ecology.

Community ecology: Community assembly, organization and evolution; biodiversity: species richness, evenness and diversity indices; endemism; species-area relationships; Ecosystem structure, function and services; nutrient cycles; biomes; habitat ecology; primary and secondary productivity; invasive species; global and climate change; applied ecology.

Evolution: Origin, evolution and diversification of life; natural selection; levels of selection. Types of selection (stabilizing, directional etc.); sexual selection; genetic drift; gene flow; adaptation; convergence; species concepts; Life history strategies; adaptive radiation; biogeography and evolutionary ecology;

Origin of genetic variation; Mendelian genetics; polygenic traits, linkage and recombination; epistasis, gene-environment interaction; heritability; population genetics;

Molecular evolution; molecular clocks; systems of classification: cladistics and phenetics; molecular systematics; gene expression and evolution.

Mathematics and Quantitative Ecology: Mathematics and statistics in ecology; Simple functions (linear, quadratic, exponential, logarithmic, etc); concept of derivatives and slope of a function; permutations and combinations; basic probability (probability of random events; sequences of events, etc); frequency distributions and their descriptive statistics (mean, variance, coefficient of variation, correlation, etc).

Statistical hypothesis testing: Concept of p-value; Type I and Type II error, test statistics like t-test and Chi-square test; basics of linear regression and ANOVA.

Behavioural Ecology: Classical ethology; neuroethology; evolutionary ethology; chemical, acoustic and visual signaling; Mating systems; sexual dimorphism; mate choice; parenting behaviour Competition; aggression; foraging behaviour; predator-prey interactions; Sociobiology: kin selection, altruism, costs and benefits of group-living.