

SEMESTER I & II
LSM1105 EVOLUTIONARY BIOLOGY

Prerequisite: GCE 'A' Level or H2 Biology or equivalent, or LSM1301 or LSM1301X

Workload: 50 lecture hours + 16 assignments hours

Evolutionary biology covers the history of life on our planet and the processes that produced the multiple life forms of Earth. Topics include: the origins of life, the eukaryotic cell, and multicellularity; the generation of genetic variation and the sorting of that variation through random processes and through natural and sexual selection; the origin of new traits, new life histories, and new species; the origins of sex, sociality, and altruism; the evolution of humans; and applications of evolutionary biology to solving modern-day problems.

S/N	Topics	Lecture hours	
		Sem 1	Sem 2
1.	What is evolution? - History of life on Earth	2 Ryan Chisholm	2 Antonia Monteiro
2.	What is the evidence for evolution? - The main factors that led to the idea of Evolution	2 Ryan Chisholm	2 Antonia Monteiro
3.	How did life evolve? - Basic organic molecules, larger organic molecules, cells, RNA world, DNA world.	2 Ryan Chisholm	2 Antonia Monteiro
4.	How do variations come about? - Mutations in protein coding genes, regulatory genes, translocations, duplications.	2 Ryan Chisholm	2 Antonia Monteiro
5.	How do variations get fixed in populations via random processes? - Drift, Hardy–Weinberg, etc.	2 Ryan Chisholm	2 Antonia Monteiro
6.	How do variations get fixed in populations via natural selection?	2 Ryan Chisholm	2 Antonia Monteiro
7.	What is the outcome of natural selection? - Morphological, physiological, and behavioural adaptations	2 Nalini Puniamoorthy	2 Antonia Monteiro
8.	What is artificial selection, and how do we use it in our lives? - Examples of evolution of agricultural crops, dogs, cattle, etc.	2 Nalini Puniamoorthy	2 Antonia Monteiro
9.	How does evolution lead to variation in life histories? -Trade-offs, reproduction, senescence	2 Nalini Puniamoorthy	2 Antonia Monteiro
10.	How does the environment determine phenotypes? - Phenotypic plasticity, epigenetics.	2 Nalini Puniamoorthy	2 Antonia Monteiro
11.	How do we connect genotypes to phenotypes? - Linkage disequilibrium, association studies, QTL mapping.	2 Nalini Puniamoorthy	2 Antonia Monteiro
12.	How do we reconstruct species relationships and interpret phylogenies? - Phylogenies, molecular clock, tree-thinking	2 Nalini Puniamoorthy	2 John Ascher
13.	Mid-term exam	2 Ryan Chisholm	2 John Ascher
14.	What are species? - History of classification	2 Nalini Puniamoorthy	2 John Ascher
15.	How does speciation occur?	2 Nalini Puniamoorthy	2 John Ascher
16.	Why sex? Causes and consequences. -Meiosis, anisogamy, costs and benefits of sex etc.	2 Nalini Puniamoorthy	2 John Ascher
17.	What is sexual selection? -Bateman's principle, reproductive fitness and models of selection	2 Nalini Puniamoorthy	2 John Ascher

S/N	Topics	Lecture hours	
		Sem 1	Sem 2
18.	What are the main transitions in evolution? - Evolution of the eukaryotic cell, multicellularity, etc.	2 Ryan Chisholm	2 John Ascher
19.	What is convergent evolution? - The comparative method, convergence, parallelisms.	2 Ryan Chisholm	2 John Ascher
20.	What is coevolution? - Mimicry, plants and pollinators, character displacement, mutualisms.	2 Ryan Chisholm	2 John Ascher
21.	What is evolutionary genomics? - Evolution of genome size and structure	2 Nalini Puniamoorthy	2 John Ascher
22.	What is evo-devo? - Deep homologies, Hox genes, eyes, limbs, conserved toolkit of development	2 Nalini Puniamoorthy	2 Antonia Monteiro
23.	How do novel traits originate? - Evolution of genetic architecture and gene regulation	2 Nalini Puniamoorthy	2 Antonia Monteiro
24.	How do sociality and altruism evolve?	2 Ryan Chisholm	2 John Ascher
25.	How did humans evolve?	2 Ryan Chisholm	2 John Ascher
26.	How does evolution affect our lives? - Bacteria and other pathogens, genetic fingerprinting and the law, mapping of human diseases, improved crops.	2 Ryan Chisholm	2 John Ascher
		Total Lectures: 50h Homework assignments: 4h Weekly quizzes: 8h Continuous Assessment: 2h Examination: 2h	
		Total hours:	66

TEXT BOOK: *Evolution* by Bergstrom and Dugatkin, second edition.

SUPPLEMENTARY READING: *The Red Queen* by Matt Ridley, *Into the Jungle* by Sean Carroll, *The Beak of the Finch* by Jonathan Weiner

MODE OF ASSESSMENTS: 70% CA (30% Mid-term CA, 20% Weekly Quiz & 20% Assignments) & 30% Final Exam

MODULE CO-ORDINATOR:

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