

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Self-learning	21U4LSS2	Evolutionary Biology	IV		50	50	100

### Course Objectives

1	To understand the process of origin of life and diversification of species.
2	To appreciate the effects of natural selection, variation and adaptation in evolution of different life forms.
3	To provide insights into co-evolution, molecular evolution and human evolution.

### Unit-I: Origin of Life and Evidences for Evolution

Origin of life – theories – creation- cosmozoic theory - spontaneous generation- Oparin and JBS Haldane, Chemical evolution – Urey Miller hypothesis, Biogenesis – Fransisco Reddy’s experiment, origin of prokaryotic & eukaryotic cell, Evidences of evolution – Comparative anatomy, vestigial organs, living fossils, Embryological – ontogeny repeats phylogeny.

### Unit – II: Natural selection, variation and adaptation

Pre Darwinism– Lamarckism, Charles Darwin and William Huxley -Natural selection theory, mode of selection - Directional selection –Stabilising selection, Balancing selection, Disruptive selection, Adaptations – variations and origin, adaptive trends, Mimicry and Coloration, Sexual selection – Convergent, Divergent and Parallel evolution, Neodarwinism - Hardy Weinberg law, forces of evolution – mutation, migration, random genetic drift, founder’s effect, bottleneck effect

### Unit – III: Speciation and co-evolution

Reproductive isolation mechanisms - Prezygotic isolation - Habitat, temporal/seasonal, ethological, mechanical, gametic, Postzygotic isolation – hybrid inviability, hybrid sterility, hybrid breakdown, origin of species – species concept, modes of speciation – allopatric, sympatric and paprapatric, speciation in plants – polyploidy, hybridisation, Kin selection& altruism – Hamilton’s rule, Co-evolution – co-operation & conflict, Prey-predator/parasite-host, mutualism, symbiosis, commensalism.

### Unit – IV Macroevolution and extinction

Macroevolution– Heterochrony, allometric changes, pedomorphosis, peramorphosis, Molecular evolution – gene birth – duplication, exon shuffling, Gene families, pseudogenes, death of a gene, protein coding genes, gene expression, evolution of chromosome number & structure – fission, fusion, inversion, transposable elements – horizontal gene transfer-rate of evolution, punctuated equilibrium, causes and consequences of extinction.

### Unit-V History of life and Human evolution

Geological eras, Fossils and fossilization, dating of fossils, Human origin - Ancestors of primates – Apes, fossil ancestors of man - Dryopithecus, Australopithecus, *Homo habilis*, *H. erectus*, *H. Neanderthalensis*(Neanderthal man), The Cro-magnon, *Homo sapiens* (Modern man), Socio-cultural evolution – Language, Human influences on evolution - Domestication.

### Books for reference

1. SanjibChattopadhyay. 2008. Life: Evolution, Adaptation and Ethology, 2<sup>nd</sup> edition, Books and Allied Priv Ltd, India
2. Futuyma and Kirckpatrick. 2017. Evolution. 4<sup>th</sup> edition, Sinauer Associates, Inc., Publishers, USA.
3. Mark Ridley. 2004. Evolution. 3<sup>rd</sup> edition, Blackwell Publishing, UK.
4. Hall, Hallgrimsson, Strickberger. 2014. Evolution, 5<sup>th</sup> edition, Jones & Bartlett Learning, USA.
5. Ernst Mayr. 2002. What Evolution is? Phoneix, UK.