

Bachelor of Science (Prog.) in Applied Life Sciences
Agrochemicals and Pest Management
SEMESTER-VIII

ZOOLOGY COMPONENT

DISCIPLINE SPECIFIC CORE COURSE: ALS ZOO DSC 08
CONCEPT OF EVOLUTIONARY BIOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE- REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practicals/ Practice		
Concept of Evolutionary Biology ALS ZOO DSC 08	4	2	Nil	2	Appeared in Sem-VII	NA

Learning Objectives:

- The learning objectives of this course are as follows:
- To understand evolutionary forces leading to the variations and diversification of species.
- To learn about deciphering evidences ranging from fossil records to molecular data and to establish phylogenetic relationships of species.
- To gain knowledge of the processes and patterns of biological evolution.
- To get acquainted with origin and evolution of man.
- To acquire problem solving and high order analytical skills by attempting numerical problems as well as performing simulation studies of various evolutionary forces in action.

Learning Outcomes:

By studying this course, students will be able to:

- To gain knowledge about the relationship of the evolution of various species and the environment they live in.

- To apply the knowledge gained on populations in real time, while studying speciation, behaviour and susceptibility to diseases.
- To have a better understanding of the variations and genetic drift to ensure that conservation efforts for small, threatened populations are focused in right direction.
- To predict the Practical implications of various evolutionary forces acting on the insect population in the field of human health, agriculture and wildlife conservation.

Theory

30 h

Unit- 1 Origin of life and Historical Review of Evolutionary Concepts.

8 h

Lamarckism, Darwinism, Neo-Darwinism, Chemogeny, RNA world, biogeny, origin of photosynthesis, endo-symbiotic theory

Unit- 2: Evidences of Evolution

4 h

Palaeontological Evidences: geological time scale, Origin and Evolution of Insects; Molecular Evidences: neutral theory of evolution, molecular clock

Unit-3: Causes and Mechanism of Organic Evolution

9 h

Variations: Heritable variations and their role in evolution. Natural selection, types of natural selection, artificial selection, kin selection, adaptive resemblances, sexual selection, frequency dependent selection. Natural selection (concept of fitness, selection coefficient), genetic drift (founder's effect, bottleneck phenomenon), migration and mutation (genetic load).

Unit-4: Species, Speciation and Extinction

5 h

Speciation micro-evolutionary changes (inter-population variations, clines, Ring species, races), species concept, isolating mechanisms.

4 h

Mass extinctions (events, causes and effects), Detailed explanation of K-T extinction

Practicals

60 hrs

(Laboratory periods: 15 classes of 4 hrs each)

1. Study of fossils (types, forms and dating) from models/pictures.
2. Study of homology, analogy and homoplasy from suitable specimens.
3. Study of different modes of speciation and adaptive radiation/macroevolution using suitable examples.

4. Study of variations in a sample human population: (a) Continuous variation: Height/Weight in relation to age and sex (b) Discontinuous variation: Ability/Inability to taste Phenylthiocarbamide (PTC).
5. Study of Hardy-Weinberg Equilibrium: statement, assumptions, derivation of the equation and its verification by chi square analysis.
6. Demonstration of role of natural selection and genetic drift in changing allelic frequencies using simulation studies.

Suggested Readings:

1. Roberts, A. (2018) Evolution: the human story, Dorling, Kindersley Ltd.
2. Hall, B.K. and Hallgrimson, B. (2013). Evolution. V Edition, Jones and Barlett Publishers.
3. Campbell, N.A. and Reece J.B. (2011). Biology. IX Edition. Pearson, Benjamin, Cummings. 4. Barton N.H., Briggs D.E.G., Eisen J.A., Goldstein D.B. and Patel N.H., (2007) 1st Ed. Evolution, Cold Spring Harbor Laboratory Press.

Additional Resources:

1. Futuyma, Douglas and Mark, Kirkpatrick (2017) 3rd Ed. Evolutionary Biology, Oxford University Press.
2. Zimmer C. and Emlen D. J., (2013) 1stEd. Evolution: Making Sense of Life, Roberts & Co.
3. Pevsner, J. (2009). Bioinformatics and Functional Genomics. II Edition, Wiley Blackwell.
4. Ridley, M. (2004). Evolution. III Edition, Blackwell publishing.
5. UGC INFONET / DU E-Resources & SciFinder Web Version registration

NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.