



JYOTI NIVAS COLLEGE AUTONOMOUS BANGALORE – 560 095
DEPARTMENT OF ZOOLOGY
B.Sc. VI SEMESTER ZOOLOGY PAPER VII SYLLABUS (2021 NEP BATCH)
EVOLUTIONARY & DEVELOPMENTAL BIOLOGY

COURSE TITLE	EVOLUTIONARY & DEVELOPMENTAL BIOLOGY
COURSE CODE	21VIZL7 (T)
COURSE CREDITS	04
TOTAL CONTACT HOURS	60
DURATION OF ESE	2 ½ Hours
CONTINUOUS INTERNAL ASSESSMENT (CIA)	40 Marks
END SEMESTER EXAMINATION (ESE)	60 Marks

Course Objectives (COs)

1. To understand the concepts of origin of life, evolution, and speciation
2. To understand various forces influencing evolution.
3. To Identify and discuss the different types of evidence that support evolution.
4. To acquire knowledge about the reproductive cycle and gamete formation and fertilization in animals.
5. To gain an understanding of the process of embryonic development, implantation, and placentation in mammals.

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

1. Describe the different mechanisms of speciation and extinction.
2. Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.
3. List the different stages of gametogenesis, fertilization, and early development in frog, chick, and mammals.
4. Explain the role of developmental genes in organogenesis.
5. Understand how the single cell formed at fertilization forms an embryo and the its development.

CO Mapping with Knowledge Levels

CO No.	Course outcomes statement	Knowledge level
1	Describe the different mechanisms of speciation and extinction.	K1, K2, K3, K5
2	Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change	K1, K2, K4
3	List the different stages of gametogenesis, fertilization, and early development in frog, chick, and mammals	K1, K2, K3, K4, K5
4	Explain the role of developmental genes in organogenesis	K1, K2, K4, K5, K6
5	Understand how the single cell formed at fertilization forms an embryo and the its development	K1, K2, K4, K5

Knowledge Levels- K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

	CO1	CO2	CO3	CO4	CO5
PO1	✓	✓	✓	✓	✓
PO2	✓	✓	✓	✓	✓
PO3			✓		✓
PO4		✓		✓	✓
PO5					
PO6			✓		
PO7	✓	✓	✓	✓	✓
PO8	✓	✓			
PO9		✓			✓
PO10	✓	✓	✓	✓	✓

Program Objectives aligned with Graduate attributes

PO1- Knowledge, PO2- Scientific thinking, PO3- Entrepreneurial skills
 PO4- Analytical skills, PO5- Communication skills, PO6- Social commitment
 PO7- Research and Inquiry, PO8- Conservation of Environment
 PO9- Employability, PO10- Academic orientation

Chapter1: Theories of Evolution

7 Hrs.

Origin of Life, Historical review of evolutionary concept: Lamarckism, Darwinism (Natural, Sexual and Artificial selection), Modern synthetic theory of evolution, Weiseman's germplasm theory and Mutation theory. Adaptive radiations: Patterns of evolution (Divergence, Convergence, Parallel, Co-evolution)

Chapter2: Population Genetics

8 Hrs.

Microevolution and Macroevolution: allele frequencies, genotype frequencies, Hardy-Weinberg equilibrium and conditions for its maintenance.

Factors influencing allele frequency: Migration, Mutation, Natural selection (Introduction, and types: Stabilizing selection, disruptive selection, and directional selection), Random genetic drift, Founder Principle and Bottleneck effect. Outlines of molecular evolution

Chapter 3. Evidence of Evolution

8 Hrs.

Indirect evidences- Connecting link, Anatomical, morphological, Serological and Embryological evidences.

Direct evidence- Palaeontological evidences: Fossils, their importance, formation, types of Fossils (Petrifaction, preservations, Impressions, Moulds, and casts). Fossil dating (Uranium-lead method, Potassium-argon method, Fission track method and Radiocarbon (C14) method. Evolution of man: salient features of each stage

Chapter 4: Isolation, Speciation and Extinction

7 Hrs.

Isolation: Definition and Types of pre-mating isolations (Isolation by time, Spatial isolation, Geographical isolation, Reproductive isolation). Types of reproductive isolation mechanisms- Prezygotic and post-zygotic isolating mechanisms.

Speciation-Types of speciation Instantaneous speciation (mutation and chromosomal aberration), Gradual speciation, (Sympatric, Allopatric, Parapatric and Peripatric speciation).

Geological time scale - Eras, periods, epochs with major fauna of each period.

Mass extinction (Causes and names of five major extinctions).

Chapter 5: Gametogenesis. Fertilization and Early Development

8 Hrs.

Gametogenesis-Spermatogenesis and Oogenesis. Types of eggs based on the quantum and distribution of yolk, based on the presence or absence of shell. Organization of egg, Functions of yolk. Egg membranes and evolutionary significance of Cleidoic egg (Example: Hen's egg). Fertilization- Introduction, types, mechanism of fertilization prevention of polyspermy (slow block and fast block)

Cleavage: Planes of cleavage, Cleavage patterns based on the amount (holoblastic and meroblastic cleavage), and based on the distribution of yolk (Discoidal and superficial), Based on the angle of mitotic spindle (Radial and spiral). Based on the fate of blastomeres (Determinate, and indeterminate cleavage). placenta and yolk sac placenta). Morphological and histological types of placentae with suitable examples.

ZOOLOGY PRACTICAL PAPER VII

COURSE TITLE	EVOLUTIONARY & DEVELOPMENTAL BIOLOGY
COURSE CODE	21VIZL7 (P)
COURSE CREDITS	02
TOTAL CONTACT HOURS	4 Hours/week
DURATION OF ESE	03 hours
CONTINUOUS INTERNAL ASSESSMENT (CIA)	25 Marks
END SEMESTER EXAMINATION (ESE)	25 Marks

Experiments

1. Study of adaptive radiation-Mouthparts of mosquito and cockroach
2. Study of Homologous Organs-Fore limb of Frog and Bird.
3. Study of serial homology- appendages of prawn.
4. Study of Analogous Organs-Wing of bird and insect.
5. Study of Vestigial Organs-Appendix, wisdom tooth.
6. Study of fossils (Petrified fish, Ammonite, Trilobite and Coprolite).
7. Study of population genetics: Hardy-Weinberg's law on genes and genotype frequency in Mendelian population- Gene frequency problem
8. Types of eggs based on quantity and distribution of yolk: Alecithal, Centrolecithal, Mesolecithal and Macrolecithal eggs.
9. Frog embryology- early cleavage, late cleavage, blastula, gastrula and neurula and life cycle.
10. Chick Embryology- 18, 24, 36, 48 and 72 hrs chick embryo.
11. Report submission on stages of embryo development and life cycle using *Drosophila* culture or chick embryo development by Windowpane technique.

References

1. Ridley, M (2004) Evolution (3rd edition) Blackwell Publishing
2. Hall, B.K. and Hallgrimson, B (2008) Evolution (4th edition) Jones and Barlett Publishers
3. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). Evolution. Cold Spring, Harbour Laboratory Press.
4. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
5. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
6. Developmental Biology: T. Subramaniam, (Reprint), Narosa Publishing House Pvt. Ltd., New Delhi
7. Human Embryology and Developmental Biology E-Book: Bruce M. Carlson, Elsevier

Health Sciences.

8. Developmental Biology: Michael J. F. Barresi, Scott F. Gilbert, Oxford University Press. (2019).

9. Developmental biology: Werner A. Müller, Springer Science & Business Media. (2012).