

Tribhuvan University
Institute of Science and Technology
M Sc Zoology
Semester II
Course of Study
2071

General Objectives

- To make the M. Sc. Programme in Zoology more practical and relevant to the professional needs as required by the country.
- To provide the students with advanced knowledge in the area of specialization and upgrading the quality so that M.Sc. students in Zoology could compete academically with other universities of the international level.

Semester II

Course Title: Evolution, Embryology and Ethology

Credits: 3

Course No: Zoo 551

Lecture hrs: 45

Nature of the Course: Theory

Full marks: 75

Pass marks: 37.5

Objectives

- To help students to know the principles of evolutionary biology.
- To impart knowledge on development systems of chordates.
- To provide knowledge on distribution and behaviour types of animal in nature.

Course Contents

Evolution: Introduction, evidences, theories & mechanism. Evolutionary processes in population and species: variation, natural selection and adaptation, Isolation. Speciation. Sexual selection. Basic concepts of molecular evolution. **12 hrs**

Biogeography and Distribution: Zoo-geographical realms (Horizontal or Superficial): Australian, Ethiopian, Palaeartic, Nearctic, Neo-tropical and Oriental with characteristic fauna. Bio-geographic processes. Sub-realms. Patterns of geological distribution of animals. Bathymetric distribution, Introduction, Organic realms (Geo-biotic, Limno-biotic and Halo-biotic), Inter – migration of animals **13 hrs**

Embryology: Embryonic cell differentiation. Development of brain, eye and heart in vertebrates. Embryonic induction and evocators. Embryo transfer. (male and female infertility, treatment for infertility, IVF, process of embryo transfer, success rate, ethical consideration). Haemolytic diseases in the newly born human babies. Recent developments in embryology. **10 hrs**

Ethology: Stereo- and Acquired types. Social behaviour. Reproductive behaviour (Courtship, Parental care and role of Pheromones). Agnostic behaviour. Migratory behaviour. **10 hrs**

References

- Andrew Ferguson (1980) Biochemical systematics and evolution, Blackie Publ., London
- Beach, F.A. (1952) Patterns of Sexual Behaviour, Eyre and Spottis Woode, London.
- Charles, R.H. (1982) Fundamental concepts in the design of experiments, Holt, Rinechart and Wintson, New York.
- Dobzhansky, T. (1976) Genetics and Origin of species, Columbia University, USA
- Dobzhansky, T., Ayala, F.J., Stebbins, G.L and J.W. Valantine (1976) Evolution, Surjeet Publ. New Delhi
- Douglas J. Futuyma (2005) Evolution, Sinauer Associates, New York
- Douglas J. Futuyma (1998) Evolutionary Biology (3rd Edition), Sinauer Associates, New York.
- Laurence D. Mueller (2005) Evolution and Ecology of the Organism, Prentice Hall, New York
- Manning (1967) An Introduction to Animal Behaviour, Arrol, London.
- Mark Ridley (2003) Evolution (3rd edition), Blackwell Publishers, New York
- Michael R. Rose and Moore, J.R. (1979) Ideas in modern biology, Nati. History Press
- Ridley, M. (1993) Evolution, BlackWell Science Massachusetts, USA
- Sather and Gallont (1973) Biology, The Behavioural View, Exington Mars, USA

Semester II

Course Title: Ecology & Natural Resources

Credits: 3

Course No: Zoo 552

Lecture hrs: 45

Nature of the Course: Theory

Full marks: 75

Pass marks: 37.5

Objectives

- To impart advance knowledge to the M. Sc. students with ecological principles and their functional aspects.
- To explore the knowledge of natural resources.

Course Contents

Ecological limiting factors: Concept of limiting factors, Liebig's Law of Minimum, Shelford Law of Tolerance, Combined concept of limiting factors, Physical limiting factors. **5 hrs**

Ecological energetics: Nature of energy, Primary production: measurement and factors affecting primary productivities, Secondary production, Primary and Secondary productivities in terrestrial and aquatic environments, Energy flow and models of energy flow. **8 hrs**

Population Ecology: Properties of populations: Density: measurement of density; patterns of dispersion, Age structures, Sex ratios, Natalty and mortality, Emigration and immigration, Concept of population Growth and regulation, Concept of Carrying Capacity. **8 hrs**

Community Ecology: Biotic community concept, community characteristics, Community structure, Concept of community dominance, Species richness, Equitability, Heterogeneity, Community classification, Ecotypes, Ecotones, 'Edge Effect', Ecological indicators, Trophic relations in community. **10 hrs**

Ecological Interaction: Positive and Negative interactions, Co-evolution, Group selection, Evolution of ecosystem.

3 hrs

Natural Resources: Renewable (Forest, Wildlife, Soil, Range lands, Water, Sun and Air) and Non- renewable (Fossils, Fuel, Minerals) resources. Major Human impacts on Environment: Deforestation, Soil erosion, Landslide, Ozone-layer depletion. **11 hrs**

References (*recent editions*)

Krebs, C. J. Ecology, Harper International Ed., New York.

Miller, J.K. Living in the Environment, Wordsworth Pub. Co. Belmont, California.

Odum, E. P. Fundamentals of Ecology, W. B. Saunders Company, Philadelphia and London.

Ramade, F. Ecology of Natural Resources, John Wiley, New York.

Smith, R. L. Ecology and field biology. Harper Collins.

Semester II

Course Title: Research Methodology I & Biostatistics

Credits: 3

Course No: Zoo 553

Lecture hrs: 45

Nature of the Course: Theory

Full marks: 75

Pass marks: 37.5

Objectives

- To impart knowledge to the students with the importance of research and research methodology.
- To make the students acquaint with the use of Biostatistics in research fields in Zoology.

Course Contents

Research Methodology: Introduction, Identification of the research problem. Literature review. research objectives. Hypothesis. Research design, Sampling Methods. Sampling and sample size. Data Sources, Analysis, Interpretation, and Presentation and References. **10 hrs**

Biostatistics: Introduction and concepts. Sampling techniques. Sampling distribution. Frequency distribution. Graphical representation of data. Measures of Central tendency. Measures of Variation. Probability. Correlation. Regression. Hypothesis testing. Chi-square test. F-test. Z-test. Student 't' distribution. Modeling techniques: Linear, Exponential and parabolic. Analysis of variances. Non-parametric biostatistics. **35 hrs**

References

Bailey, N.T.J. (1995) Statistical Methods in Biology, London

Bishop, O.N. (1984) Statistics for Biology, Longmann, New York.

Gupta, S.C. (1995) Fundamentals of Statistics Latest Ed., Indira Gupta (Ed.) Himalayan Pub. House Bombay, India.

Kothari, C.R. (1990) Research Methodology, Second Ed. Vishwa Prakashan, India.

Singh, M.L. (1998) Understanding the Research Methodology Statistical Methods.

Semester II

Course Title: Cell & Molecular Biology and Genetics

Credits: 3

Course No: Zoo 554

Lecture hrs: 45

Nature of the Course: Theory

Full marks: 75

Pass marks: 37.5

Objectives

- To impart advance knowledge of present day in molecular and cell Biology.
- To provide knowledge on some important aspects of Genetics.

Course Contents

Cell Biology. Structure and function of cell membrane. Membrane transport principle. Vesicle transport by secretion and endocytosis. Cell metabolism. Signal molecules. Receptors in membrane. Second messenger. Role of signal molecules in gene activation. signaling pathways. cell cycle. **10 hrs**

Genetics. Mendelian and Non-Mendelian – Sex linked traits. Genetic variability. General concept of Karyotype Analysis. Genetic linkage and Linkage maps. Gene and Chromosome mutations. Population Genetics: Inheritance of qualitative traits. Gene and Genotypic frequency. Hardy and Weinberg principle. **11 hrs**

Molecular Biology. Structure and properties of nucleic acids. Central Dogma: Transcription and Translation; Structure of Eukaryotic chromosome : Satellite DNAs, Micro-Macro satellite DNA, Nuclear gene, Repeated DNA sequence, Mobile DNA. Molecular Techniques: RFLP, RADP, DdNA Amplification. PCR technology and its application. Sequencing. Restriction and Molecular Genetic Maps, Types of Cloning. Recombinant DNA Technology and Transgenic animals. **12 hrs**

Ageing. Theories of ageing – Free radical, Somatic, Mutation and Immunological. Mechanism of ageing – Intracellular, Extracellular and Molecular levels. Mental aspects of ageing. **6 hrs**

Introduction of Genetic Diseases; Cancer, Hypertension, Diabetes, Parkinson, Alzimers and Huntington. Apoptosis **6 hrs**

References

DeRobertis D.P. and E.M.F. De Robertis Jr.(1998). Cell and Molecular Biology, 8th Ed. B.I. Waverly Pvt. Ltd., New Delhi.

Edward, L.S. and John W.K. (1996) (4th Ed.) Hand book of the Biology of Ageing, Academic Press.

Gupta., P.K. (Reprint 1998) Genetics, Rastogi Pub., Meerut.

Jones, R. N. and Karp, A. (1986) Introducing Genetics, John Murray, London.

Rostogi, S.C. (1996) Cell and Molecular Biology, New Age Int. (P) Ltd. Pub., New Delhi.

Roy, S.C. and De, K.K. (1997) Cell Biology, New Central Book Agency, New Delhi.

Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, I.A. and Weiner, A.M.(1998) Molecular Biology of the gene, The Benjamin/Cuming Pub. Comp, USA.

Semester II

Course Title: Practical on Zoo 551 & 552

Credit: 2

Course No: Zoo 555

No. of Practicals: 30

Nature of the Course: Practical

Full marks: 50

Pass marks: 25

Objective

For better understanding of the topics of Zoo 551 and 552.

Course Contents

Embryological slides: Study of the embryological slides of different stages of Chick. Identification of cross sections of chick embryo through eye, ear, heart. Study of different types of placenta in mammals.

Ecology:

1. Measurement of primary productivity in aquatic and terrestrial ecosystem.
2. Determination of biomass of terrestrial habitat.
3. Transect/quadrat method of survey of plants and animals.
4. Biodiversity indices – (a) Population, (b) Density and Relative Density, (c) Frequency and Relative frequency, (f) Abundance and Distribution, (g) Shannon- Wiener index.
5. Species association

Practical note book preparation as regular study.

Report writing

Course Title: Practical on Zoo 553 & 554

Credit: 2

Course No: Zoo 556

No. of Practicals: 30

Nature of the Course: Practical

Full marks: 50

Pass marks: 25

Objective

For better understanding of the topics of course No. Zoo 553 and 554.

Course Contents

1. Study of cytological slides
2. Study of the human genetic traits
3. Screening of enzymatic activities of some genetic traits relevant to Nepali populations
4. Extraction of DNA, quantification and electrophoresis
5. Extraction of RNA, quantification and electrophoresis
6. RT-PCR, cDNA and electrophoresis
7. Extraction of Protein, quantification of Protein
8. Western Blotting.
9. Preparation of short community/family based survey report on human genetic traits.

Biostatistics: Preparation of tables and diagrams using suitable software, from the data provided. Statistical Analysis (Chi-square, t-test, correlation, regression, standard deviation and standard error) of the data derived from lab and field data using suitable software.

Practical note book preparation as regular study.
