

NATIONAL UNIVERSITY



Syllabus Department of Zoology

One Year Preliminary to Master's Course
Effective from the Session: 2016-2017

National University

Subject: Zoology

Syllabus for One-Year Preliminary to Master's Course

Effective from the Session: 2016-2017

Subject: Zoology

Paper Code	Paper Title	Credits
413101	Environmental Biology and Radiation Biology	4
413103	Biostatistics and Research Methodology	4
413105	Microbiology Parasitology and Economic Zoology	4
413107	Genetic Engineering, Biotechnology, Demography and Family Planning	4
413109	Fundamentals of Entomology	4
413111	Fundamentals of Wildlife Biology	4
413113	Fundamentals of Fish and Fisheries	4
413116	Practical and Laboratory Work with Viva-Voce	4
413118		
	Total =	32

Detailed Syllabus

Paper Code : 413101	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Environmental Biology and Radiation Biology		

Environmental Biology:

1. Concept and scope of Ecology and Environmental biology
2. Laws of Thermodynamics
3. Pollution: definition and types
4. Habitat ecology: Freshwater, Estuarine and Marine
5. Environmental management and Development planning
6. Global warming
7. Greenhouse effect
8. Ozone layer depletion
9. Deforestation and afforestation
10. El Nino and La Nina
11. Arsenic problem in Bangladesh, surface water management

Radiation Biology:

1. Concepts
2. Types of radiation
3. Radioisotopes and their use in biological, agricultural and medical research
4. Biological hazards of Radiation

Paper Code : 413103	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Biostatistics and Research Methodology		

Biostatistics:

1. Introduction, definition and scope
2. Variables, Data, Population, observation and universal variables
3. Frequency distribution, histogram and polygon

4. Measures of central tendency- mean, median and mode
5. Measures of dispersion: range, variance, standard deviation and standard error
6. t-test for single mean and t-test for difference of means
7. Chi-square test of goodness of fit and contingency tables
8. Regression and correlation; Scatter diagram, analysis of linear regression, estimation of correlation coefficient
9. Sampling

Research Methodology:

1. Introduction: Meaning of research, objectives of research, research processes, criteria for good research, problems encountered by researchers in Bangladesh.
2. Defining research problem: Selecting research problem, techniques involved in defining a problem.
3. Research design: Need for research design, basic principles of experimental designs, different research designs, developing a research plan.
4. Sampling design: Steps in sampling designs, characteristics of a good research design, different types of sampling designs, how to select a random sample? Research conclusion, references, and summary/abstract.
5. Use of biological records, biological abstracts, e-resources.
6. Use of GIS in biological research.
7. Bioinformatics: Retrieval of literature and information databases; software for biological studies.
8. Scientific Report Writing: Title, by line, abstract, Key words, introduction, acknowledgements, study area, material and methods, results, discussion and literature Cited (reports should also contain tables, photographs, illustration and maps).

Books Recommended:

1. Robert G.D. Steel and James II. Torrie. Principles and Procedures of Statistics
2. W.G. Cochran. Sampling Technique.

3. C.R.Kottari. 1990. Research Methodology: Methods and Techniques (2nd ed.)
Ram Printograph. Delhi
4. D.V. Huntsberger and B. Billingsley Elements of Statistical Inference
5. R.Sokal and J.Rohlf. Biometry

Paper Code : 413105	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Microbiology, Parasitology and Economic Zoology		

Microbiology:

1. Definition and scope of microbiology
2. Position of microorganisms in the living world: types of microorganisms and their distribution in nature.
3. Virus: discovery; structure and types; multiplication; viral diseases and their mode of transmission.
4. Bacteria: structure and types, nutrition in bacteria, bacterial multiplication, bacterial diseases and their mode of transmission.
5. Rickettsiae: discovery, structure and function
6. Antibiotics from penicillin, Streptomyces and bacillus; non-medical use of antibiotics.

Parasitology:

1. Concepts of parasites and parasitism: Scope of parasitology.
2. Life cycles: Reproduction and developmental stages of Protozoa to Helminthes.
Illustrations of one, two and three host life cycles.
3. Epidemiology: Basic concepts, incidence, prevalence, intensity, abundance, control measures and designs of control measures.
4. Human diseases caused by parasites: Morphology and life cycle of the causal organisms, and pathogenicity, epidemiology and control of leishmeniasis, trypanosomiasis, filariasis,

dengue, black fever, schistosomiasis, taeniasis, hookworm diseases, enterobiasis and plague.

5. Zoonosis: Concepts and scope; zoonotic diseases in Bangladesh.
6. Parasites of livestock, poultry and fish: Clinical and histopathological effects; major parasitic diseases of livestock, poultry and fish in Bangladesh and their control.

Economic Zoology:

1. Apiculture: Concept and scope, profiles of honey producing bee species in Bangladesh, bee-flower relationship, bee-keeping, types of hive and their management, honey processing and marketing, diseases of bees and their management.
2. Sericulture: Concept and scope, varieties of silkworm and their host plants, techniques of Silkworm rearing, silkworm diseases and pests and their control.
4. Carp culture: Types of culture, carp culture including induced breeding of carps in ponds.
5. Prawn culture: Types, techniques and management.
6. Pearl culture: Profiles of pearl-producing species, culture techniques.
7. Mericulture: Concept and scope.
8. a) Aquaculture: Components of a hatchery, fish ponds, shrimp farms, cages and pens
b) Pond culture: Types, soil and water quality, pond preparation, species selection, stocking density and management techniques of carp, mass production of fry and fingerlings, brood fish.
9. Dairy farming: Concept and scope, components of a dairy farm, major dairy farms in Bangladesh.
10. Poultry farming: Varieties of fowls and ducks, techniques of poultry farming, major diseases of poultry and their control.

Books Recommended:

1. C.F. Norton 1981. Microbiology. Addition Wesley Publ. Co., California, USA.
2. M.R. Chowdhury 1996. Modern Medical Microbiology. Dhaka, Bangladesh.
3. M.T. Pelezar, R.D. Reid and E.C.S. Chan 1993. Microbiology: Concepts and Applications. Tata McGraw Hill Inc., India.
4. R. Annanthanarayan and C.K.J. Paniker 2000. Textbook of Microbiology. Orient Longman Pvt. Ltd., India.
5. Dennis S. Hill. 1997. The economic importance of insects (1st edition) Chapman and Hall, London
6. P. Southgate and J.Lucas (Editors). 1998. Aquaculture Fish and Shellfish Farming Fishing news
7. A. Midlen and T.A. Reading 1998. Pollution Control and Environmental Management for Aquaculture. Chapman & Hall.
8. D.T. Baird. M.C.M. Beveridge. L.A. Kelly and J.F. Muir 1996. Aquaculture and Water Resource Management Fishing News
9. C.G. Scalet, L.D. Flake and D.W. Willis. 1996. Introduction to Wildlife and Fisheries: An Integrated Approach W.H. Freeman
10. G.L. Hoff A. Fairbrother and L.N. Locke (Editors). 1996. Noninfectious
11. M. Huet. 1986. Text book of Fish culture-Breeding and Cultivation of fish (2nd Edition.) News Books
12. P.H. Mine 1979 Fish and Shellfish Farming in Coastal Waters. Fishing News Books Ltd. England
13. T.C. Cheng 1973. General Parasitology. Academic Press London
14. T.C. Cheng (Editors). 1971. The Biology of Symbiosis. Butterworths London
15. G.D. Schmidt and L.S. Roberts. 1977. Foundation of Parasitology. The C.V. Mosvey Company
16. P.J. Whitfield. 1979. The Biology of Parasites. Edwards Arnold Ltd. London

17. J.D. Symth. 1976. Introduction to animal Parasitology. Hodder and Stoughton
18. K.D. Chatterjee. Parasitology (Protozoology and Helminthology in relation to clinical Medicine). Chatterjee Medical Publishers. Calcutta
19. H.W. Brown. 1969. Basic Clinical Parasitology. Appleton-Century Crofts, New York
20. J. F.A . Sprent. 1963. Parasitism. Williams and Williams, Baltimore
21. T.V on Brand. 1973. Biochemistry of Parasites. Academic Press. London
22. C.R. Kennedy 1975. Ecology Animal Parasitology. Blackwell Scientific Publications. Oxford

Paper Code : 413107	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Genetic Engineering, Biotechnology, Demography and Family Planning		

Genetic Engineering and Biotechnology:

1. Concepts and scope of genetic engineering and biotechnology
2. Extraction and preparation of genes
3. Genetic engineering and Transgenic animals
4. Principles of gene cloning; Techniques of gene cloning
5. Human Genome Project (HGP)
6. Fermentation technology; in food production and brewing, lactic acid
7. Fermentation: alcoholic fermentation

Demography and Family Planning:

1. Introduction, definition and history of Demographic Development
2. Human population and its nature of growth
3. Factors for population explosion
4. Demographic theories
5. Importance of Family planning and management
6. Sex hormones and their role in human reproduction

7. Fertilization, pregnancy, placenta and foetal development
8. Birth control: Principles and Method
9. Ethics of Family Planning

Books Recommended:

1. S.M. Kingsman and A.J. Kingsman. Genetic Engineering
2. A. Wiseman. Principles of Biotechnology
3. S.B. Primrose. Modern Biotechnology
4. B. Robson and J. Gamier. Introduction to Proteins and Protein Engineering
5. S.B. Primrose. Principles of Gene Manipulation
6. D.M. Glover. Principles of Gene cloning
7. J. Bullock and B. Kristensen. Basic Biotechnology

Paper Code : 413109	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Fundamentals of Entomology		

1. Insect form and function: Head, thorax, abdomen and appendages.
2. General classification of insects: Diagnostic characters of all Orders, with examples, and reference to Bangladesh.
3. Life history of insects: Types of eggs, larvae, pupae, metamorphosis and roles of hormones in metamorphosis.
4. Pest control measures: Concepts of Physical, mechanical, cultural, chemical, biological and legal control methods.
5. Integrated Pest Management (IPM): Concept, methods, and present status in Bangladesh.
6. Agricultural entomology: Biology, life history, nature of damage and control measures of Jute Hairy Caterpillar, Rice Hispa and Sugarcane Shoot Borer.
7. Medical and Veterinary Entomology: Biology and control measures of mosquitoes, sand flies, ticks and mites.

Books Recommended:

1. M.D. Atkin. 1980. Introduction to Insect Behaviour Macmillan Publishing Co. Inc.
2. D.J. Borror, D.M. Borror and C.A. Triplehorn 1981. Introduction to the Study of Insects. Saunders College Publishing Co. Ltd.
3. A.D. Imms's A General Text Book of Entomology. Revised by O.W. Richards and R.G. Davies. The English Language Book Society and Mathuen & Co. Ltd. London
4. C.L. Metcalf and W.P. Flint 1973. Destructive and useful insects their habits and control. Tata McGraw-Hill Publishing Co. Ltd. New Delhi. India
5. T.R.E. Southwood. Ecological Methods with particular reference to the study of insects population. Chapman & Hall, London
6. D.S. Hill. 1997. The economic importance of insects (1st edition). Chapman and Hall, London
7. D. Dent. Insects Pest Management (2nd Edition), Chapman & Hall, London.
8. H. D. Catling, S. Alam. C.M. Nurulflah and Arifur Alam Literature review of insects pests and diseases of rice in Bangladesh, Bangladesh Rice Research Institute
9. J.W. Creffield. 1996. Wood-Destroying Insects Wood Borers and Termites
CSIRO Australia

Paper Code : 413111	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Fundamentals of Wildlife Biology		

1. Definition, concepts, importance of wildlife and their role in ecological balance.
2. Status and distribution of the wildlife and their habitats in Bangladesh (forests, wetlands, village grooves, Cultivations, grasslands, bushes, etc.)
3. Species status assessment system of IUCN - global and national. Extinct wildlife of Bangladesh, with their causes of extinction. Threatened wildlife of Bangladesh and their threats.

4. Wildlife conservation: Ethics of conservation, priorities in conservation effort, ex-situ and in-situ conservation, conservation and rural development, role of culture and religion in conservation. National Conservation Strategy of Bangladesh.
5. Wildlife farming: Prospect and scope of wildlife farming in Bangladesh, general outline of wildlife farming, economic importance of wildlife farming, crocodile farming in Bangladesh.
6. Laws and conventions related to wildlife: Bangladesh Wildlife Act 1974, Forest Act 1927. Convention on Biological Diversity (1992), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973), Ramsar Convention (1971).

Books Recommended:

1. G. Cubitt and G. Mountfort. 1985. Wild India-The Wildlife and Sanctuary of India and Nepal. William Collins Sons and Co. Ltd. London.
2. S.H. Prater. 1971. The Book of Indian Animals (2) BNHS Oxford Univ. Chicago Press
3. J.C. Daniel. 1983. The Book of Indian Reptiles. Bombay Nat. Hist. Soc. Bombay
4. R. Whitaker. 1978. Common Snakes of India Macmillan Co. India.
5. R.H. Giles 1971. Wildlife Management Techniques. The Wildlife Society, Washington, D.C.
6. M.A.R. Khan 2010. Wildlife of Bangladesh - A Checklist. Sahitya Prakash, Dhaka
7. M.M.H. Khan 2008, Protected Areas of Bangladesh - A guide to wildlife. Bangladesh Forest Dept., Dhaka
8. M. Bolton (Editor), 1997. Conservation and the Use of Wildlife Resources. Chapman & Hall
9. R.M. DeGraff and R.I. Miller (Editors). 1996. Conservation of Faunal Diversity in Forested Landscapes. Chapman & Hall

Paper Code : 413113	-----	Credits : 4	Class Hours : 120 hrs.
Paper Title :	Fundamentals of Fish and Fisheries		

1. Definitions, phylogeny of fishes, placoderms and ostracoderms.
2. Structure, modification and functions of digestive, respiratory, circulatory, osmoregulatory and reproductive systems of fish.
3. Principles and techniques of fishery systematic study: Collection, preservation, taxonomic procedures, meristic and non-meristic studies.
4. Classification, status and distribution of freshwater fishes in Bangladesh.
5. Structure, modification and functions of scales, fins, swim bladder, lateral line and electric organs. Physiology of swim bladder, lateral line and electric organs.
6. Biology of common fishes of Bangladesh: Life history, embryology, food and feeding habits, fecundity, spawning and economic importance of carps, hilsa, tilapia and catfish.
7. Limnology: Definition and importance of limnology, types of inland waters, dynamics of lotic and lentic environments, physical and chemical properties of water and their influences, biotic community of inland waters, productivity of waters.

Books Recommended:

1. M. King 1995. Fisheries Biology, Assessment and Management. Blackwell Science.
2. K.F. Lagler. J.E. Bardach, R.R. Miller and D.R.M. Passino. 1977. Ichthyology. John Willey and Sons, New York
3. A.K.A. Rahman] 1989. Fresh water Fisher of Bangladesh Published by the Zoological Society of Bangladesh Dhaka
4. P.S. Welch. 1952. Limnology. McGraw-Hill Book Co. New York

5. J. Bartram and R. Balance (Editors), 1996. Water Quality Monitoring: A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programme on spawn.
6. W.S. Hoar and D.J. Randall (Editor) 1971. Fish Physiology. Vols. I-V. Academic Press. New York. London
7. G.K. Reid and R.B. Wood. 1976. Ecology of Inland Waters and Estuaries. Reinhold Publishing Co. New York
8. Y.C. Shang. 1982. Aquaculture Economics: Basic Concepts and Methods of Analysis. Croom Helm. Ltd., London
9. I.G. Cowx (Editors), 1998. Stocking and Introduction of Fish. Fishing News
10. J.F. Caddy and R.C. Griffiths. 1995. Living Marine Resources and Their Sustainable Development: Some environmental and Institutional Perspectives. FAO, Italy

Paper Code :	413116	Credits : 4	
	413118		
Paper Title :	Practical and Laboratory Work with Viva-Voce		

1. Study of Museum Specimens (Both Non-chordate and Chordates)
2. Study of histological slides (Both Chordates and Non-chordates)
3. Study of the axial and appendicular skeletal bones of Amphibia, Reptilia, Aves and Mammalia.
4. Dissection of the following:
 - a) Nervous system of Grasshopper
 - b) Nervous system of Prawn
 - c) Brain and cranial nerves of Dogfish

- d) Brain and cranial nerves of Carp
5. Study of fresh water micro/macro fauna.
6. Techniques and preparation of histological slides.
7. Simple experiment on physiology; Blood pressure and pulse rate, Blood group
8. Bio-statistical problems: preparation of frequency distribution table - measures of arithmetic mean, mode, median and standard deviation
9. Visit to an organization having zoological activities such as poultry, fish etc. and preparation of a report on the visit
10. Preparation of a note book on the practical and laboratory works
11. Viva-Voce

2 Days practical 6 hours' daily

Total marks 100

Distribution of marks of practical examination.

1st day

1. One non-chordate and one vertebrate dissection. 8 +8=16 marks
(Dissection 4+ Display 1+ Drawing and labeling =3)
2. Identification (Non-chordate 2, vertebrate 2, bones 2, permanent slide 2) 8 x 2 = 16 marks
3. Freshwater studies (three micro and two macro species to be shown) 5 x 2 = 10 marks

2nd day

4. Micro technique and slide preparation (Block 3, section 3, stretching 3) =9 marks
5. Physiological experiment =10 marks
7. Micro technique (Staining 3. identification 1, drawing and labeling 3. character 2) =9 marks
8. Bio-statistical problem (one) =10marks
9. **Viva-Voce** (including field report and practical notebook) (10 + 5 + 5) =20 marks