Syllabus
Department of Zoology

Four Year B.Sc Honours Course
Effective from the
Session : 2009–2010
Course Code: 3152, Course Title: Introduction to Zoology Marks 100, 4
Credits, 60 Lectures

1. Introduction
   Concept, history and scope of zoology, subdivisions of zoology, application and importance of zoology, relation of animals to human.

2. Origin of Life
   Spontaneous generation, special creation, cosmic, naturalistic and recent theories.

3. Foundation of Animal Life
   Origin of life – major stages in the early evolution of life (e.g. Stage I – Molecular, Stage II – Polymeric, Stage III – Semi-biotic and Stage IV – Cellular); level of organization (protoplasmic, cellular, tissue, organ, organ system, organism, species, individual, population, community, fauna, biota, ecosystem, biosphere and biodiversity).
4. **Fundamentals of Cytology and Histology**
Cells – cell and cell theory, structure and function of cell membrane, organelles and nucleus; chromosomes structure and function; nucleic acid, replication of DNA; gene – nature, chemical composition and action; cell cycles and cellular differentiation, cell division; tissue – types, structure and function.

Body forms (sexual, developmental and polymorphic), symmetry, polarity of the body, metamerism, tagmatization, appendages (flagella, cilia, antenna, styles, poda, fins, wings and limbs); embryogeny (radial, spiral, determinate and indeterminate cleavages; germinal layers and coelom types); protostomia and deuterostomia; morphometrics and meristics.

5. **Classification of Animals**
Number of kingdoms; classification up to phyla on the basis of organization, symmetry, coelom and phylogeny; different taxa and Linnaean hierarchy and nomenclature.

6. **Methods of Studying Animals**
Collection, sampling, transportation, preservation, identification and tagging.

7. **Instrumentation in Zoological Studies**
Microscopy, configuration, incubation, balance, collecting devices and kits, microtomes, habitat analysis kits, haemocytometer, sphygmomanometer, photography, camera lucida and micrometer.

8. **Science 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/illustrations and maps).

10. **Informatics**
Retrieval of literature and information databases; software for biological studies.

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**Course Code:** 3153, **Course Title:** Protozoa and Non-chordates Marks 100, 4 Credits, 60 Lectures

1. **General characters with examples of protozoans, mesozoans and parazoans; radiate, acelomate and pseudocelomate animals.**

2. **Broad classification of the following phyla up to orders with general and diagnostic characteristics of each taxonomic category with examples and affinities:**
   - Sarcomastigophora, Apicomplexa, Ciliophora, Porifera, Cnidaria, Platyhelminthes, Annelida, Nematoda, Mollusca, Arthropoda, Echinodermata and Hemichordata.

3. **Type study of the following with their origin, evolution, systematic position, habitats, external morphology, organ systems such as digestion, movement, circulation, respiration, excretion, nervous, reproduction, food and feeding habits, mode of life and development.**
b. Phylum Apicomplexa: *Eimeria*

c. Phylum Ciliophora: *Paramecium*

d. Phylum Porifera: *Scypha*

e. Phylum Cnidaria: *Obelia* and *Aurelia*

f. Phylum Ctenophora: *Hormiphora*

g. Phylum Platyhelminthes: *Taenia*

h. Phylum Nematoda: *Ascaris*

i. Phylum Acanthocephala: *Macracanthorhynchus*

j. Phylum Mollusca: *Pila* and *Lamellidens*

k. Phylum Annelida: *Neanthes*

l. Phylum Onychophora: *Peripatus*

m. Phylum Arthropoda: prawn and grasshopper

n. Phylum Bryozoa/Ectoprocta: *Bugula*

o. Phylum Brachiopoda: *Lingula*

p. Phylum Chaetognatha: *Sagitta*

q. Phylum Echinodermata: *Asteropecten*

r. Phylum Hemichordata: *Balanoglossus*

4. Brief notes on the following including habits, habitats, and food and feeding –

**Sarcomastigophora**: *Trypanosoma, Leishmania*

**Ciliophora**: *Vorticella*

**Porifera**: *Spongilla*

**Cnidaria**: *Physalia, Gorgonia*

**Ctenophora**: *Bero*

**Platyhelminthes**: *Fasciola, Schistosoma*

**Nematoda**: *Meloidogyne Sipuncula: Sipunculus*

**Mollusca**: *Dentalium, Loligo, Octopus*

**Annelida**: *Chaetopterus, Tubifex*

**Arthropoda**: *Balanus, Scolopendra, housefly, Drosophila*

**Echinodermata**: *Echinus, brittle star*

Course Code: 3154, Course Title: Environmental Biology Marks 100, 4 Credits, 60 Lectures


2. **Pollution**: definition and types – a. Air pollution – sources, effects, types and control measures.
c. Soil pollution – sources, effects and prevention.
d. Noise pollution – sources, effects and prevention.

3. **Use of agrochemicals:** Types, reasons for use, effects and impacts on environment.


5. Environmental management and development planning.

6. Sewerage disposal, garbage and waste management.

7. Global climate change.

8. Acid rain and its impact on environment.


11. **Disaster management:** Earthquake, flood, cyclone, tidal surges, drought, river erosion with particular reference to Bangladesh.

12. Arsenic problem in Bangladesh.


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**Course Code:** 3160, **Course Title:** Zoology Practical-I *(time: 6 hrs in one day) Marks 100, 4 Credits, 90 Hours Practical Classes*

1. **Study of museum specimens:** Representative of all major non-chordate phyla (minimum 50 specimens to be studied).

2. **Study of permanent slides:** Whole mount, body parts and various cells and invertebrate tissues (at least 20 slides to be studied)
   a. Whole animals – representatives of protozoans, rotifers and arthropods.
   b. Mouth parts of arthropods.
   c. Parasites – nematodes and platyhelminths.
   d. Different larval forms of invertebrates.
   e. Histological slides of invertebrates.
4. External morphology and dissection of various organ systems of earthworm, cockroach, prawn, *Pila* and *Lamellidens*.

   a. Digestive system of prawn, *Pila* and *Lamellidens*.
   b. Circulatory system of earthworm and prawn.
   c. Nervous system of cockroach, grasshopper, prawn, *Pila* and *Lamellidens*.
   d. Reproductive systems of earthworm, cockroach, grasshopper and prawn.

5. Temporary mounting –
   a. Brain of earthworm.
   b. Salivary gland of cockroach.
   c. Statocyst of prawn.

6. Study of appendages (locomotory, prehensile, food capture, copulatory, defensive and offensive organs of cockroach and prawn).

7. Field visit to observe local invertebrate fauna, or field visit to a farm, and prepare a report on the visit.

**Distribution of Marks for First Year Final Examination**

1. Major dissection (dissection 10 + display 2 + drawing and labeling 6) = 18 marks.
2. Minor dissection (dissection 5 + display 2 + drawing and labeling 3) = 10 marks.
3. Temporary mount (staining, mounting and display 5 + drawing and labeling 4) = 9 marks.
4. Spotting of museum specimens – 15 items (identification and classification 1 + diagnostic characteristics 1) = 30 marks.
   a. Invertebrate specimens (9 items) 2 × 9 = 18 marks.
   b. Whole mount slides (mouth parts, parasites, larvae) (3 items) 2 × 3 = 6 marks.
   c. Histological slides (3 items) 2 × 3 = 6 marks.
5. Appendages (detachment, placement and drawing on a paper sheet 4, labeling 3, displaying 1) = 8 marks.
6. Report writing on field visit = 15 marks.
7. Class records = 10 marks.

**Books Recommended:**

17. প্রাণিবিজ্ঞান, (প্রাণের এবং এস-একটিএ), সংশোধন প্রকাশক চৌধুরী নাজিমুদ্দিন, নিলোপ প্রকাশনী-বাংলা বাজার, ঢাকা। (২০০৪)
18. প্রাণিরপার্শ্ব প্রথম, বাহ্য-রূপের প্রাণী-২০০৪, ডঃ সৈদা কুমার দত্ত এবং অন্যান্য, "লিক্স প্রানাস-বাংলা বাজার, ঢাকা।
19. প্রাণিবিজ্ঞান পরিচিতি-২০০৩, ডঃ সৈদা এলিভানেস এবং অন্যান্য, "লিক্স প্রানাস, বাংলাবাজার, ঢাকা।
20. "ইনহার ফাইল, প্রকাশক খন ও ডাক করিও"
21. প্রাণিবিজ্ঞানের ভিত্তি, আমার প্রসেস, গোবাইরের (প্রাণী) লিখ, বাঙালি বাজার, ঢাকা।
22. প্রাণিবিজ্ঞানের প্রথম পাঠ-প্রকাশক কে. এম. বোর্ডের, কবরি প্রাণিবিজ্ঞানে।
1. **Measurements and the Scientific Method:** Measurements, units, SI units, reliability of measurements – precision and accuracy, rounding off, significant figures, significant figures in calculation, mean and median, errors, sources of errors.

2. **Structure of atom:** Atom, isotopes, atomic masses, mass spectroscopy, atomic nucleus, nuclear binding energy, nuclear reactions – fission and fusion reactions, Bohr atom model, spectrum of atomic hydrogen, dual nature of electron, Heisenberg uncertainty principle, quantum numbers, atomic orbitals, Aufbau principle, pauli exclusion principle, Hund’s rule of maximum multiplicity, electronic configuration of atoms.

3. **Periodic Table:** Periodic law, periodic table, electronic configurations from the periodic table, periodic properties of the elements such as ionization energies, electron affinity, electron negativity, atomic/ionic radius along a period and down a group, diagonal relationship.

4. **Chemical Bonds:** Chemical bond, types of chemical bonds – ionic, covalent coordination, metallic, hydrogen, polar and non-polar covalent bonds, Lewis dot structure, shapes of molecules, VSEPR theory, valence bond theory, hybridization, $\sigma$- and $\pi$-bonding in compounds, molecular orbital theory.

5. **Oxidation and reduction:** Redox reactions, writing and balancing redox reactions.

6. **States of Matter:** Comparison between solids, liquids and gases, changes of state, m.p. and b.p., phase transition, phase diagram of water.

7. **Gaseous and Their Properties:** The gas laws, the perfect gas equation, the kietic theory of gases, Van der waals equations, real gases, Graham’s laws of diffusion and effusion.

8. **Solutions:** Solubility and intermolecular forces, solubility product, types of concentration units, colligative properties of solutions, Henry’s law, Nernst distribution law.

9. **Acids and Bases:** Various concepts on acids and bases, conjugate acids and bases, neutralization reactions acid-base strength, pH, acid-base titrations, acid-base indicators, acid-base properties of salts, the common ion effect, buffer solutions, hard and soft acids and bases.

10. **Chemical Equilibrium:** Reversible reactions and the equilibrium state, the equilibrium law, reaction quotients and equilibrium constants, calculations using $K_c$, $K_p$.

   Homogeneous and heterogeneous equilibria, the principle of Le Chatelier and Brown.

11. **Hydrocarbons:** Hydrocarbons, saturated and unsaturated hydrocarbons, alkanes, alkenes, and alkynes, nomenclature of organic compounds - the IUPAC system natural gas, petroleum, petrochemicals.

12. **Study of different classes of organic Compounds:** Alcohols, aldehydes, ketones, carboxylic acids, esters, amines and amides.
Books recommended:

4. Principles of physical chemistry, M. M. Huque and M. A Nawab, students’ publications.
7. A Level Chemistry by C.W. Ramsden
8. Organic Chemistry: T Morrison and R.N Boyed,

Course Code: 6285, Course Title: Chemistry-I Practical Marks 50, 2 Credits, 30 Lectures

1. Preparation of FeSO$_4$·$n$H$_2$O, Mohr’s salt and potash alum.
2. Separation and identification of four radicals from a mixture of anions and cations The cations are Pb$^{2+}$, Cu$^{2+}$, Cd$^{2+}$, Al$^{3+}$, Fe$^{2+}$, Fe$^{3+}$, Co$^{2+}$, Ni$^{2+}$, Zn$^{2+}$, Ca$^{2+}$, Ba$^{2+}$, Na$^+$, K$^+$, and NH$_4$+, the anions are NO$_3^-$, CO$_3^{2-}$, S$^{2-}$, SO$_4^{2-}$, Cl$^-$, Br and I. 3. Standardization of NaOH solution using standard oxalic acid solution. 4. Determination of Fe$^{2+}$ using standard permanganate solution
5. Iodometric determination of copper(II) using standard Na$:SO_3$ solution.
6. Gravimetric determination of nickel as Ni(HDMG)$_2$ complex 7. Determination of the enthalpy change for the decomposition sodium dicarbonate into sodium carbonate.
8. Determination of the pH- neutralization curves of a strong acid by a strong base.
9. Investigation of the conductance behaviour of electrolytic solution and applications (acetic acid)
10. Determination of the presence of nitrogen, halogen and sulphur in organic compounds.

11. Identification of the functional groups (unsaturation, alcohol, phenol, carbonyl, aldehyde, ketone, carboxylic acid, aromatic amine, amide and nitro- groups) in organic compound.

Books Recommended:

3. Practical physical chemistry, A Faraday.
Course Code: 6293, Course Title: Biochemistry-I, Marks: 100, Credits: 4

1. **Acid, base & buffer:** Ion product of water; acid base pH, indicators, buffer solution and buffer apacity, some biological buffer.

2. **Thermodynamics:** 1st law of thermodynamics, enthalpy, Hess’s law, 2nd law of thermodynamics, Entropy, standard states, spontaneous, reversible, irreversible and non-equilibrium reactions steady state.

3. **Cell:** Cell, Sub-cellular particles and structure and their isolation and identification; their functions.

4. **Carbohydrates:** Nomenclature, classification, optical properties, general reactions, colour test and methods of estimation, isolation from natural sources and structure of glucose, fructose, galactose, sucrose, lactose, maltose, starch, glycogen, cellulose, amino sugar. Biological importance of carbohydrates.

5. **Lipids:** Nomenclature, classification. Reactions of fatty acids, sterols and methods of estimation; structure and biological functions of different classes of lipids. Role of phospholipid in membrane formation - the fluid mosaic model.

6. **Amino acids and Peptides:** Structural features, optical activity and classification of amino acids, reaction of amino acids, ionization in solution, isoelectric behaviour, colour tests, isolation of amino acids from protein hydrolysates, peptide bonds and biologically important peptides.

7. **Proteins:** General introduction; biological functions classification based on shape. Structure: different levels of structural organization (in brief). Enzymes - chemical nature; effect of substrate. Temperature and pH on its activity, Michaelis-Menten equation, significance of $K_m$ values and $V_{max}$; enzyme inhibition, digestive enzymes.

8. **Nucleosides and nucleotides:** Basic chemistry of nucleosides and nucleotides: polynucleotides.

9. **Vitamins:** Classification, occurrence, deficiency symptoms, biological functions, vitamins as coenzymes.

10. **Hormones:** Definition, Classification, their importance and functions.

**Books Recommended:**

1. *Lehninger Principle of Biochemistry*
   By: David L., Nelson and Michael M.Cox.
   Publisher: W.H. Freeman and company, New York.

2. *Biochemistry*
   By: Lubert Stryer.
   Publisher: W.H. Freeman and company, New York.

3. *Biochemistry*
   By: Donald Voit and Juldith Voit.
   Publisher: John Viliy & Sons.

4. *Cell and Molecular biology*
   By: Gerald Karp.
   Publisher: John Viliy & Sons.
Course Code: 6295, Course Title: Biochemistry-I Practical, Marks: 50, Credits: 2

a) Preparation of standard solution and standardization of HCL.
b) Estimation of calcium in biological sample.
c) Determination of ascorbic acid content of a biological sample.
d) Color tests for bio-molecules.
e) Determination of lactose content of milk.
f) Determination of phosphorus content of the supplied solution.

Course Code: 6302, Course Title: Botany -I Marks 100, 4 Credits, 60 Lectures

1. Introduction: Origin and evolution of life; differences between plants and animals; modern concepts of classification of living organisms.
2. Microbiology:
   a) Introduction to Viroids, Prions, Rickettsia and Mycoplasma.
   b) Virus: Physical and chemical nature of phage, plant and animal viruses, multiplication of HIV virus and economic importance.
   c) Bacteria: Types, fine structure, reproduction and importance.
   d) Fungi: Habitat, characteristics, classification up to class (Alexopoulos), reproduction, importance, life history of *Saccharomyces*.
   e) Cyanobacteria: Habitat, characteristics, structure, importance of Cyanobacteria.
   f) Algae: Habitat, characteristics, classification up to class (Fritsch), reproduction, importance; life history of *Oeodogonium*.
   g) Phytoplankton: Habitat, characteristics, classification and importance.
3. Lichen: Habitat, characteristics, classification and importance.
4. Limnology: Definition, scope, importance and classification of lakes.
5. Bryophyta: Habitat, characteristics, classification up to classes and reproduction; life history of *Riccia* and *Anthoceros*.
6. Pteridophyta: Habitat, characteristics, classification up to classes, importance; life history of *Selaginella* and *Christella*.
7. Gymnosperms: Habitat, characteristics and importance; life history of *Cycas* and *Gnetum*.
8. Angiosperms: Habitat, characteristics, ICBN, classification systems of plant kingdom. (Artificial, natural & phylogenetic). Identifying characters and economic importance of the following families: (a) Fabaceae, (b) Solanaceae and (c) Malvaceae and (d) Poaceae.
9. Plant Pathology: Concept of diseases in plants, causes, diagnosis, classification and importance of plant diseases, symptomatology and control measures; forecasting of plant diseases.
Causal organisms, symptoms and control measures of brown spot of rice, stem rot of jute, citrus canker and tungro disease of rice.

10. Economic Botany: Local and scientific names, parts used and importance of at least 8 prominent plants of each of the following groups: (a) Food, (b) medicine, (c) timber, (d) fibre, (e) oil and (f) vegetables. Cultivation and processing of tea and rubber.

**Books Recommended**

   - Introduction to the Algae, Prentice Hall, India
3. Hawker, Lilian, E. 1967
   - Fungi, Hutchinson Univ. Library, Cambridge Univ. Press, London.

Book Co. and N.R. Krieg. 1993
6. Vashista, P.C. 1993

7. Mukherji, H. and Ganguly, 2000:

   0. রায়, শ্যামল কুমার, পাল, নিশীথ কুমার
      গাঢ়, মোক্ষ কামাল, ১৯৯৫
   1. খান, আজমাজদ আলী এবং
      তরিকুল ইসলাম
   2. খককার মনির সৈদ, ১৯৯৪
   3. বাসার, এম. এ., এম.এ, হাসান এবং
      ম. রফিকুল ইসলাম, ২০০৪ 13
      হাসান, এম. এ, এবং
      এম. কে. আলম, ১৯৯৭ 14. খাবুন, রানেয়া,
      ২০০২
Course Code: 6305, Course Title: Botany -I Practical Marks 50, 2 Credits, 30 Lectures, Time: 6 hours

1. Detail study including dissection (where necessary), mounting, drawing, description and identification with classification of the following genera:

   Cyanobacteria: Nostoc, Anabaena
   Algae: Saccaromyces and Accoboiius
   Bryophyte: Riccia and Marchantia
   Pteridophyte: Selaginella, Christella
   Gymnosperms: Cycas
   Angiosperm: Poaceae and Fabaceae

2. Identification of the following genera with reasons:

   Algae: Volvox, Polysiphonea and Fucas.
   Fungi: Rhizopus, A garicus, Puccinia and Penicillium.
   Lichen: Crustose, Foliose and Fructose.
   Bryophyte: Anthoceros, Semibarbula.
   Pteridophyte: Selaginella, Marsilea, Azolla and Pteris
   Gymnosperms: Male and female cones of Cycas.
   Angiosperms: Scientific names of common plants around the institution.
3. Find out algal specimens from local fresh water sample; draw and describe..........05

5. Detailed taxonomic study of the families as included in the theory syllabus. ...............08
6. Study of plant and plant parts, and economic uses of angiosperms included in the syllabus. ..........06
7. Preparation of herbarium specimens of local plants and submission during examination. ...............05
8. Laboratory Note book. ..........05

Books Recommended:

10. Vashista, P.C. 1993

11. পাশা, মোস্তফা কামাল
   রায়, শামল কুমার, ১৯৮৬
12. আমারলম্বাংমান, ম.
   আমারলম্বাংমান, ম. ২০০০
13. ইসলাম, এ., এস., ১৯৮৪
14. কর্মকার, মুহুলাল, ২০০০
15. খান, আমজাদ আলী এবং
   তরিকুল ইসলাম
16. খন্নকার মনির আমাদ, ১৯৭৪
17. জামান, এম., এ., ১৯৭৫
18. বাবার, এম., এ., এম.এ, হাসান এবং
   ম. রফিকুল ইসলাম, ২০০৪
19. হাসান, এম. এ., ১৯৯৬
20. হাসান, এম. এ., এবং
    এম. কে. আলম, ১৯৯৭

   Ramnagar, New Delhi.

: বাংলা একাডেমী, ঢাকা।

বর্ণশাঙ্গিতি বিদ্যা, হাসান বুক হাউজ, ঢাকা।

2. বিদ্বেষ্ট বাংলা, হাসান বুক হাউজ, ঢাকা।

বর্ণশাঙ্গিতি বিদ্যার মূল কথা, বাংলা একাডেমী, ঢাকা। উড়িষ্যা শরীর বিজ্ঞান, হাসান বুক হাউজ, ঢাকা।

: বাংলা একাডেমী, ঢাকা।

: বিদ্যালয় বিষয়ক, তথ্য বিশ্ববিদ্যালয় প্রকাশনা, ঢাকা।

: কোষবিদ্যা, বাংলা একাডেমী, ঢাকা।

: উড়িষ্যা বিজ্ঞান, হাসান বুক হাউজ, বাংলা বাজার, ঢাকা।

: বাংলাদেশের ভৌতিক উড়িষ্যা, অশারিফিয়া বহু হর, বাংলা বাজার, ঢাকা।

: উড়িষ্যা শ্রেণী বিন্যাস তত্ত্ব (৩য় সংস্করণ), হাসান বুক হাউস, ঢাকা।