

NATIONAL UNIVERSITY



Syllabus Department of Botany

**Four Year B.Sc Honours Course
Effective from the
Session : 2009–2010**

National University
Subject: Botany
Syllabus for Four Year B.Sc Honours Course
Effective from the Session: 2009-2010

Year wise courses and marks distribution

First Year (Honours)

Course Code	Course Title	Marks	Credits
	Microbiology	100	4
	Mycology	100	4
	Higher Cryptogams	100	4
	Practical	100	4
	Chemistry-I	100	4
	Chemistry-I Practical	50	2
	Introduction to Zoology: Protozoa and non-chordates, Human Physiology, and Applied Zoology	100	4
	Zoology Practical – I	50	2
	Total=	700	28

Detailed Syllabus

First Year

Course Code : Microbiology

100 Marks, 4 Credits, 60 Lectures

1. Introduction: A brief historical background and scope of the subject.
2. Living organisms: Characters and possible origin, biogenesis, spontaneous generation and germ theory of infectious diseases.
3. Position of microorganisms in the 5-kingdom system of R. H. Whittaker (1969).
4. Prions, Viroids, Rickettsia and Mycoplasma: Structure, properties and importance.
5. Viruses: Nature, structure of simple RNA virus (TMV) and DNA virus (T₂ phage); multiplication of viruses: transmission of plant viruses, importance of viruses.
6. Archaeobacteria: Characteristics and importance.
7. Bacteria: Prokaryotic nature, size, shape and arrangement of bacterial cell; surface appendages - flagella, pili, capsule, cell wall, nucleoid, protoplast, endospore. Multiplication of bacteria (binary fission), and basis of genetic recombination in bacteria. Importance of bacteria.
8. Actinomycetes: Discovery, structure, reproduction and importance.
9. Growth and nutrition of microorganisms: Generation time, phases of growth curve, essential elements of microbial growth, nutritional groups of microorganisms – Autotrophs and heterotrophs.
10. Microbial association: Commensalism, synergism, antagonism and symbiosis.

Books Recommended

1. Frobisher, M., R.D. Hinsdill, K.T. Grabtree and C.R. Goodheart. 1974: Fundamentals of Microbiology (9th ed.). W.B. Saunders Co. London.
2. Dubey, R.C. and D.K. Maheshwari. 1999: A Text Book of Microbiology. S. Chand and Co. Ltd.
3. Pelczer, M.J., E.C.S. Chan and N.R. Krieg. 1993: Microbiology: Concepts and Applications. McGraw Hill Book Co. Inc. New York.
4. Tortora, G.J., B.R. Funke and C.L. Case. 1997: Microbiology (6th ed.) Addison Wesley Longman, Inc., California.
5. ইসলাম, এম. রফিকুল, মিহির লাল সাহা এবং এম. এ. বাসার. ২০০৪: অণুজীব বিজ্ঞান, হাসান বুক হাউজ, ঢাকা।

Course Code : Mycology

100 Marks, 4 Credits, 60 Lectures

1. Introduction: The subject Mycology and its scope
2. Myxomycetes: A brief account of the habit, habitats, structure, reproduction and importance of the group.
3. Fungi: General characteristics, ultrastructure, somatic structure, cell wall composition, growth, nutrition, reproduction, sexual compatibility.
4. Origin and classification of fungi as given by G. C. Ainsworth (1966) and C. J. Alexopoulos & C. W. Mims (1986).
5. General characteristics of the following fungal classes and study of the somatic and reproductive features of the genera mentioned against each class:
 - (i) Chytridiomycetes: *Olpidium*, *Synchytrium*;
 - (b) Oomycetes: *Saprolegnia*, *Phytophthora* and *Albugo*;
 - (c) Zygomycetes: *Rhizopus*;
 - (d) Ascomycetes: *Saccharomyces*, *Aspergillus*, *Penicillium*, *Erysiphe*, *Meliola*, *Claviceps*, *Neurospora*;
 - (e) Basidiomycetes: *Puccinia*, *Ustilago*, *Tilletia*, *Polyporus*, *Agaricus*;
 - (f) Deuteromycetes: *Candida*, *Alternaria*, *Cercospora*, *Fusarium*, *Macrophomina*, *Colletotrichum* and *Marssonina*.
6. A general discussion on the role of fungi as: (i) Saprophytes in nature, (ii) Plant parasites, (iii) Mycorrhizae as plant symbionts, and (iv) Producers of important metabolites.
7. Lichen: Habitats, habit, morphology (thallus types), anatomy, reproduction and importance.

Books Recommended

1. Ainsworth, G. C. 1996 . A general purpose classification of fungi. Bibliography of systematic Mycology, pp 1-4, Commonwealth Mycological Institute, London.
2. Alexopoulos, C.J., C.W. Mims and M. Blackwell. 1996: Introductory Mycology (4th ed.), Wiley, Eastern Ltd., Calcutta, India.
3. Hawker, Lilian, E. 1967: Fungi, Hutchinson Univ. Library, Cambridge Univ. Press, London.
4. Moore-Landecker, Elizabeth. 1982: Fundamentals of the Fungi. Prentice-Hall. Inc., New Jersey, USA.
5. Webster, J. 1980: Introduction to Fungi. Cambridge Univ. Press, London, UK.

a. Bryophyta

1. Introduction: General characters and classification of Bryophyta; range of structures with relation to habit, habitat and distribution; alternation of generations in Bryophyta.
2. Habit, habitat, distribution, external and internal features, growth, reproduction, spore dispersal mechanism, ecology, importance and phylogeny of the following groups:
 - i) Hepaticae, (ii) Anthocerotae and (iii) Musci
3. Fossil Bryophyta.
4. Origin and evolution of Bryophyta.

b. Pteridophyta

1. Introduction: General characters and classification of Pteridophyta.
2. Origin and evolution of Pteridophyta.
3. Types of stele and their evolution.
4. Habit, habitat, distribution, external and internal features, reproduction, ecological and economic importance, and phylogeny of the following groups.
 - (i) Psilophyta: Psilotales;
 - (ii) Lepidophyta: Lycopodiales and Selaginellales (with reference to heterospory and seed habit:
 - (iii) Calamophyta: Equisetaceae;
 - (iv) Pterophyta; (a) Definition of Eu- and Leptosporangiate and development of Eu- and Leptosporangiate sporangia; (b) Eusporangiate: Ophioglossales; (c) Leptosporangiate: (i) Filicales; Osmundaceae, Polypodiaceae and Parkeriaceae, (ii) Marsileales and (iii) Salviniaceae.
5. Spore dispersal mechanism in Pteridophyta.

Books Recommended

1. Bapna, K.R. and P. Kachroo. 2000. Hepaticology in India-I & II. Himangshu Publications, Udaipur, Delhi.
2. Emes, A.J. 1964. Morphology of vascular plants. Tata McGraw-Hill Publishing Co., Ltd., Bombay
3. Parihar, N.S. 1956. An Introduction to Embryophyta Vol. I, & II Central Book Depot, Allahabad.
4. Rashid, A. 1976. An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. 576 Masjid Road, Jangpura, New Delhi.
5. Smith, G.M. 1955. Cryptogamic Botany, Vol. I & II. McGraw-Hill Book Company Inc. New York, London.
6. Vashista, P.C. 1993. Botany for Degree Students: Pteridophyta, S.Chand and Company Ltd., Ramnagar, New Delhi.
7. Watson, E.V. 1974. The Structure and Life of Bryophytes. B.I. Publications. Bombay-Calcutta-Delhi-Madras.

Practical

Course Code : Microbiology and Mycology 50 Marks, 2 Credits, 30 Lectures

Microbiology; 25 Marks

1. Potato culture to study different types of bacterial colonies.
2. Plate culture using Nutrient Agar (NA) medium
3. Purification of bacterial culture: (i) stock plate method and (ii) dilution plate method.
4. Differential staining: (i) gram staining and (i) spore staining.
5. Demonstration of fermentation.
6. .Observation of C/S test results.
7. Study of the symptoms of available plant diseases caused by viruses and bacteria.

Mycology; 25 Marks

1. Techniques for preparing temporary slides of fungal specimens for microscopic examinations.
2. Laboratory studies of the locally available members of the Myxomycetes and fungi covered in the theory.
3. Preparation of culture medium for fungal growth like Potato dextrose Agar (P.D. A.) and growing fungi for class work.

Course Code : Higher Cryptogams

50 Marks, 2 Credits, 30 Lectures

A. Higher Cryptogams (Bryophyta)

1. The following members need to be studied and identified up to genus (i) *Riccia*, (ii) *Dumortiera*, (iii) *Plagiochasma*, (iv) *Marchantia*, (v) *Lejunea* and (vi) *Anthoceros*.
2. The following members will be on demonstration in the practical class. The students are required to be acquainted with these members: (i) *Riccia fluitans*, (ii) *Ricciocarpus natans*, (iii) *Sphagnum*, (iv) *Physcomitrium*, (v) *Fissidens*, (v) *Leucobryum* and (iv) *Plagiothecium*.

B. Higher Cryptogams (Pteridophyta)

1. The following members are to be studied and identified up to the genus.
(i) *Lycopodium*, (ii) *Selaginella*, (iii) *Equisetum*, (iv) *Nephrodium*, (v) *Pteris*, (vi) *Lygodium*, (vii) *Marsilea*, (viii) *Azolla* and (iv) *Ceratopteris*.
2. The following members are to be demonstrated in the practical classes: (i) *Psilotum*, (ii) *Isoetes*, (iii) *Salvinia*, (iv) *Drynaria* and (v) *Niphobolus*.

- 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, Electro 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, σ - and π -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 kinetic 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, p^H , 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:

1. General Chemistry, D. D. Ebbing, Houghton Mifflin Co.
2. Chemistry – The Molecular Nature of Matter and Change, M. Silberberg. WCB /Mc Graw- Hill.
3. Introduction to Modern Inorganic Chemistry, S.Z. Haider, Friends' International.
4. Principles of physical chemistry, M. M. Huque and M. A Nawab, students' publications.
5. Essentials of Physical chemistry, B.S Bahl, G.D Tuli and A Bahl, S. Chand & Co.Ltd.
6. Advanced Organic Chemistry, B.S. Bahl and A Bahl, S. Chand & Co. Ltd.
7. A Level chemistry by C.W. Ramsden
8. Organic Chemistry: T Morrison and R.N. Boyed,
9. Fundamental of Organic Chemistry by W Solomons

Course Code : Chemistry-I Practical

100 Marks, 4 Credits, 60 Lectures

1. Preparation of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 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_2SO_3 solution.
6. Gravimetric determination of nickel as $\text{Ni}(\text{HDMG})_2$ complex
7. Determination of the enthalpy change for the decomposition sodium dicarbonate into sodium carbonate.
8. Determination of the p^{H} - 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:

1. A Text Book of Quantitative Inorganic Analysis, A.I. Vogel, 3rd/4th edition, ELBS and Longman Green & Co. Ltd.
2. A Text Book of Quantitative Inorganic Analysis, A.I. Vogel 3rd /4th edition, ELBS and Longman Green & Co. Ltd.
3. Practical physical chemistry, A Faraday.
4. A Text Book of practical organic chemistry, A.I. Vogel, ELBS edition.

Course Code : Introduction to Zoology: Protozoa and non-chordates, Human Physiology, and Applied Zoology Marks 100, 4 Credits, 60 Lectures

Group-A: Introduction to Zoology: Protozoa and non-chordates

Introduction to Zoology: Definition and scope of zoology. Foundation of animal life: Level of organization (protoplasmic, cellular, tissue, organ, organ system, organism, species, individual, population, community, fauna, biota, ecosystem, biosphere, biodiversity). Cells: Cell and cell theory, structure and functions of cell organelles. Gametogenesis: Spermatogenesis and oogenesis; placentation. Classification of animals: Animal kingdoms; classification up to phyla on the basis of organization, symmetry, coelom and phylogeny; different taxa and Linnean hierarchy and nomenclature.

Protozoa and non-chordates: General characteristics of the following protozoa and non-chordates phyla with examples – Apicomplexa, Ciliophora, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Gastrotricha, Nematomorpha, Rotifera, Acanthocephala, Kinorhyncha, Loricifera, Priapulida, Supuncula, Pogonophora, Tardigrada, Onychophora, Phoronida, Brachiopoda, Bryozoa/Ectoprocta, Chaetognatha, Echinodermata, and Hemichordata.

General and diagnostic characteristics of the following phyla with examples – Sarcomastigophora, Annelida, Arthropoda and Mollusca.

Type study of the following with their systematic position, habitats, external morphology, organ systems such as digestion, movement, circulation, respiration, excretion, nervous, and reproduction; food and feeding habits, mode of life and development –

- a. Phylum Sarcomastigophora: *Euglena*
- b. Phylum Apicomplexa: *Eimeria*
- c. Phylum Ciliophora: *Paramecium*
- d. Phylum Porifera: *Scypha*
- e. Phylum Cnidaria: *Obelia*
- f. Phylum Nematoda: *Ascaris*
- g. Phylum Mollusca: *Pila*
- h. Phylum Arthropoda: Prawn
- i. Phylum Echinodermata: *Astropecten*
- j. Phylum Hemichordata: *Balanoglossus*.

Group-B: Human Physiology and Applied Zoology

Human Physiology: Outline of the physiology of digestion, blood circulation, respiration, excretion and reproduction; endocrine glands and their functions; vitamins and vitamin deficiency diseases.

Applied Zoology: Introduction to the major fields of applied zoology: Entomology, Fisheries Biology, Wildlife Biology, and Parasitology. Agricultural pests: Major pests of rice, jute, sugarcane and stored grains. Integrated fish farming: Types, poultry, livestock and paddy-cum-fish culture. Poultry farming: System of poultry farming, diseases of poultry and their control, economic importance of poultry and their impacts on socio-economic condition of Bangladesh.

Course Code : Zoology Practical-I (time: 6 hrs in one day) Marks 50, 2 Credits, 30 Lectures

1. **Study of museum specimens:** Representative of all major non-chordate phyla (minimum 20 specimens to be studied).
2. **Study of permanent slides:** Whole mount, body parts and various cells and invertebrate tissues (at least 10 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.
3. **Preparation and study of whole mounts of different non-chordates.**
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*.

5. Temporary mounting –

- a. Brain of earthworm.
- b. Salivary gland of cockroach.
- c. Statocyst of prawn.

6. Study of appendages of prawn.

7. Animal physiology –

- a. Estimation of blood pressure and pulse rate.
- b. Determination of blood group.

8. Class records.

Distribution of Marks for First Year Final Examination

1. Major dissection (dissection 8 + display 2 + drawing and labeling 3) = **13 marks.**
2. Temporary mount (staining, mounting and display 3 + drawing and labeling 2) = **5 marks.**
3. Spotting of museum specimens – 8 items (identification and classification 1 + diagnostic characteristics 1) = **16 marks.**
 - a. Invertebrate specimens (4 items) $2 \times 4 = 8$ marks.
 - b. Whole mount slides (mouth parts, parasites, larvae) (2 items) $2 \times 2 = 4$ marks.
 - c. Histological slides (2 items) $2 \times 2 = 4$ marks.
4. Appendages (detachment, placement and drawing on a paper sheet 3, labeling 2, displaying 1) = **6 marks.**
5. Class records = **10 marks.**

Books Recommended:

1. C.P. Hickman and L.S Roberts. 1995. *Animal Diversity* Wm.C. Brown
2. L.S. Dillon. 1976. *Animal Variety: An Evolutionary Account*: Wm C. brown Company Publishers, Dubuque, Iowa.
3. J.D. Bernal. 1969. *The Origin of Life*. Weidenfeld and Nicolson, London.
4. E.E. Ruppert and R.D. Barnes. 1994. *Invertebrate Zoology* (6th edition). Saunders College Publishing-harcourt Brace College Publishers, New York, London
5. C.P. Hickman. *Integrated Principles of Zoology*, C.V. Morsby Co. Inc., New York
6. A.J. Marshal and W.D. Williams. *Text Book of Zoollogy Invertebrates*, (edited the 7th edition of Text Book of Zoology, Vol. I, T.J. Parker and W.A. Haswell)
7. N.J. Reigle. *A Synoptic Introduction to the Animal Kingdom*.
8. E.O. Wilson, T, Eisner and W.R. Briggs, *Life: Cells, Organisms Populations*.
9. C.C. Chatterjee Human Physiology Vols. I & II
10. W.H. Davson . *A Text Book of General Physiology*
11. G.L. Presser and P.A. Brown Comparative Animal Physiology
12. B.I. balinsky. *An Introductio of Embryology*
13. D. Dent. Insect Pest Management. Chapman and Hall, London.

14. P. Southgalte and J. Lucas (eds), 1998. Aquaculture Fish and Shellfish Farming Fishing News.
15. M. King. 1995. Fisheries Biology Assessment and Management. Blackwell Science.
16. C.G. Scalet. L.D. Flake and D.W. Willis. 1996. Introduction to Wildlife and Fisheries: An Integrated Approach. W.H. Freeman.
17. TVR. Pillay. 1993. Aquaculture: Principles and Practices. Fishing News Books.
18. L.P. Pedigo. Entomology and Pest Management.
19. R.Wall and D. Shearer, 1997. Vetenerary Entomology. Chapman & Hall
20. V.G. Jingran and R.S.V. Pull in 1985. A Hatchery Manual for the Common, Chinese and Indian Major Carps. ADB/ICLARM
২১. মোঃ আব্দুর রাজ্জাক মিয়া । ২০০৭ । পোলট্রি ব্যবস্থাপনা । বাংলা একাডেমী ।
২২. গৌতম বুদ্ধ দাশ । ২০০৪ । পোলট্রি উৎপাদন । বাংলা একাডেমী ।
২৩. এ. এইচ. এম. মোস্তফা । ১৯৯৪ । খামারে হাঁস-মুরগী পালন ও রোগ-ব্যাধির চিকিৎসা । বাংলা একাডেমী ।