

NATIONAL UNIVERSITY

BANGLADESH



First Year Syllabus

Department of Zoology

Four-Year B.Sc. (Honours) Program
Effective from the Session: 2024-2025

Mission:

To promote “Progress for Everyone” by fostering transformative education, conducting pioneering research, and encouraging meaningful collaboration with individuals, communities, and partners both in Bangladesh and around the world.

Vision:

We expect that the hundredth anniversary of the National University, our commitment to “Progress for Everyone” will be evident in all areas of our operations and stakeholder engagements.

We leverage our core strength in education, research, and community engagement to address pressing global issues and foster sustainable development.

By 2042, National University aims to strengthen its positions as Bangladesh’s top academic institution and rank among the world’s leading universities. Our focus will be on expanding expertise building strategic partnerships, and increasing our global influence. Our services will be measured by the achievements of the individuals and communities we serve.

Name of the Program: B.Sc. (Honours) in Zoology

Program Educational Objectives (PEOs)

PEO 1: To produce graduates with strong theoretical and practical knowledge of Zoology according to the requirements of contemporary market demand.

PEO 2: To develop graduates capable of performing interdisciplinary and collaborative research and demonstrating technical competence in the field of Zoology.

PEO 3: To develop graduates who can help to deliver adequate, relevant and timely biological knowledge to facilitate research, planning and decision-making program for the government and the community for achieving Sustainable Development Goals (SDGs) of Bangladesh.

PEO 4: To produce graduates with strong leadership, teamwork, communication skills and ethical and moral values that will help them in their professional lives.

Program Learning Outcomes (PLOs): At the time of graduation, B.Sc. (Honours) in Zoology students will have achieved the ability to:

PLO 1: Fundamental Knowledge of Zoology: Demonstrate a comprehensive understanding of core zoological concepts, including invertebrate and vertebrate diversity, anatomy, physiology, genetics, evolution, economic importance and ecology.

PLO 2: Taxonomic and Biodiversity Expertise: Identify, classify, and analyze animal species, with emphasis on Bangladesh’s native fauna and conservation challenges.

PLO 3: Laboratory and Field Research Skills: Perform advanced laboratory techniques (e.g., microscopy, dissection, staining, basic biochemical tests, DNA analysis) and field studies (e.g., specimen collection, ecological surveys) relevant to zoological research.

PLO 4: Scientific Inquiry and Critical Thinking: Design, conduct, and interpret scientific experiments in Bangladesh's diverse ecosystems using hypothesis-driven approaches and statistical tools.

PLO 5: Conservation and Environmental Awareness: Evaluate climate change and human impacts on wildlife and ecosystems, and propose sustainable conservation strategies for Bangladesh's biodiversity. Assess threats and propose community-based conservation strategies in different situation including vector management and environmental issues.

PLO 6: Data Analysis and Computational Skills: Utilize bioinformatics, GIS, and statistical software to analyze zoological data and interpret research findings.

PLO 7: Communication and Scientific Reporting: Present research findings effectively through scientific writing, oral presentations, and digital media in both Bengali and English.

PLO 8: Ethical and Professional Responsibility: Follow ethical guidelines in animal handling, research, wildlife conservation, and academic integrity while considering socio-ecological responsibilities.

PLO 9: Interdisciplinary Application: Relate zoology to agriculture, fisheries, public health (e.g., zoonotic diseases), microbiology, and biotechnology for practical applications in Bangladesh.

PLO 10: Career and Leadership Readiness: Develop transferable skills (teamwork, project management, problem-solving) for careers in academia, research, fisheries, wildlife management, public health, and environmental policy.

Mapping of PEOs with PLOs

	PEO-1	PEO-2	PEO-3	PEO-4
PLO-1	√			
PLO-2		√	√	
PLO-3	√	√		
PLO-4		√		√
PLO-5			√	
PLO-6	√	√		√
PLO-7			√	√
PLO-8		√	√	√
PLO-9	√	√	√	
PLO-10	√			√

First Year wise Courses and Marks Distribution

First Year

Course Code	Course Title	Marks	Credits
213101	Introduction to Zoology	100	4
213103	Animal Diversity-I: Protozoa and Non-chordates	100	4
213105	Ecology	100	4
213106	Zoology Practical-I	100	4
212807	Chemistry-I Chemistry-I Practical	100	4
212808		50	2
213007	Botany-I Botany-I Practical	100	4
213008		50	2
219901	History of Bangladesh: Language, Culture and Identity	100	4
219903	Information and Communication Technology	75	3
219904	Lab: Information and Communication Technology	25	1
	Total=	900	36

Detailed Syllabus

Course Code	213101	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Introduction to Zoology			

Course Objectives

This course is an introduction to basic concepts in biology through study of the major lineages of invertebrate and vertebrate animals, with emphasis on the ontogeny, structure, and function of organ systems in an evolutionary context. Topics covered will include basic cell structure and function, development, systematics, and evolution. The students will be able to understand the living organisms with a focus on the animal kingdom.

Course Learning Outcomes (CLOs):

After going through the course, students will be able to learn the following outcomes:

CLO1	To explain foundational concepts: Define the scope, history, and evolutionary theories of zoology and analyze their relevance to modern biological sciences.
CLO2	To classify animal diversity: Apply principles of animal classification (e.g., symmetry, coelom, phylogeny) and use taxonomic keys to categorize major animal phyla based on morphological and embryological traits.
CLO3	To conduct field and lab procedures: Demonstrate techniques for animal collection, preservation, habitat analysis, and instrumentation (e.g., microscopy, sampling kits) following ethical and scientific protocols.
CLO4	To evaluate biodiversity conservation: Assess Bangladesh's habitats, biodiversity threats, and conservation strategies using ecological principles (e.g., food webs, niches) and calculate biodiversity indices.
CLO5	To synthesize zoology's societal role: Propose applications of zoological knowledge for sustainable development (e.g., SDGs), emphasizing human-animal relationships and ecosystem services in Bangladesh

Mapping of CLOs with PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	√									
CLO2		√								
CLO3			√					√		
CLO4					√	√				
CLO5							√		√	

Course Contents:

Topics	Teaching Learning Strategy	CLOs
<p>1. Introduction: Concept, history and scope of Zoology, subdivisions, application and importance of Zoology, relation of animals to human.</p> <p>Case Study 1: The Case of the Urban Mosquito – From Physiology to Public Health</p>	Lecture, Group Discussion	CLO1 CLO5
<p>2. Origin of Life: Spontaneous generation, special creation, cosmic, naturalistic and recent theories. major stages in the early evolution of life (e.g. Stage I – Molecular, Stage II – Polymeric, Stage III – Semi-biotic and Stage IV – Cellular), concept of phylogeny; geological time scale and emergence of various animal groups, phylogenetic relationship and phylogenetic tree; fossils, concept of evolution.</p>	Lecture, Group Discussion, Assignment	CLO1
<p>3. Bases of animal classification: Body forms (sexual, developmental and polymorphic), germ layers; coelom, symmetry, polarity, metamerism, tagmatization, appendages (flagella, cilia, antenna, styles, poda, fins, wings and limbs); Skeleton, embryogenic (radial, spiral, determinate and indeterminate cleavages; germinal layers and coelom types); Protostomia and Deuterostomia; morphometrics and meristic.</p>	Lecture, Group Discussion, and Workshop	CLO2
<p>4. Foundation of Animal Life: Gene, DNA, level of organization (protoplasmic, cellular, tissue, organ, organ system, organism, species, subspecies, variety, sibling species, overview of naming of species, individual, population, community, fauna, biota, biosphere, and biodiversity).</p>	Lecture, Group Discussion, Workshop, and Presentation	CLO1
<p>5. Overview of animal classification system: History of classification and classification system, taxonomic categories, taxonomic keys and characters, and their uses. Number of kingdoms; classification up to phyla based on organization, symmetry, coelom, and phylogeny; different taxa and Linnaean hierarchy and nomenclature.</p>	Lecture, Group Discussion, Assignment	CLO2
<p>6. Methods of Studying Animals: Concept of survey and monitoring of animals; observation and methods of observation. Collection, sampling (qualitative and</p>	Lecture, Group Discussion, Workshop, and	CLO3

quantitative), transportation, preservation, identification, description, tagging, materials, referencing, and publication	Presentation	
7. Habitat and Ecosystem: Concept, types, major habitats in Bangladesh, food chain, food web, ecological niche, biomass, ecological pyramid, energy transfer system, Ecological footprints.	Lecture, Group Discussion	CLO4 CLO5
8. Biodiversity: Concept, types, components, importance and values, bioresources – threats and conservation importance, estimation and calculation process of biodiversity, faunal diversity in Bangladesh. Case Study 2: The Unexplored Canopy – Integrating Field Methods, Taxonomy, and Biodiversity Assessment	Lecture, Group Discussion, and Assignment	CLO2 CLO4
9. Instrumentation Techniques in Zoological Studies and Report writing: Microscopy techniques in higher magnification and photo collection system, spectrophotometers, incubation, balance, collecting devices and kits, microtomes, habitat analysis kits, haemocytometer, sphygmomanometer, photography, techniques of using camera and micrometer.	Lecture, Group Discussion, Workshop, and Presentation	CLO3
10. Introduction to Scientific Writing: Importance and purpose of scientific communication, Differences between essays, reports, and research Courses, Literature Review & Citation, Overview of the article structure (Title, Abstract, Introduction, Methods, Results, Discussion, Acknowledgment and Referencing system).		

List of Books:

- Chandra, S., & Kumar, G. (2023). *Bio-instrumentation and biological techniques*. Pkpublication, India.
- Gaston, K. J., & Spicer, J. I. (2013). *Biodiversity: An introduction* (2nd ed.). John Wiley and Sons Inc., New York.
- Gilbert, S. F. (2006). *Developmental Biology*. Sinauer Associates Inc., USA.
- Hickman, C. P., Keen, S. L., Eisenhour, D. J., Larson, A., & I'Anson, H. (2023). *Integrated principles of zoology* (19th ed.). McGraw-Hill Co. Inc., New York, USA.
- IUCN. (2015). *Red List of Bangladesh* (Vol. 1 to 7). Forest Department, MoEF&CC, GoB. Dhaka, Bangladesh.
- Karp, G. (2005). *Cell and molecular biology (concept and experiments)* (4th ed.). John Wiley and Sons Inc., New York.

Lal, S. S. (2022). *Laboratory techniques in zoology: Principles and methods* (3rd ed.). Rastogi Publications, U.P. India.

Miller, G., Brown, D. A., & Spoolman, S. (2024). *Environmental science* (17th ed.). Cengage Learning, Pacific Grove, CA, USA.

Odum, E. P., & Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Thomson Brooks/Cole Publishing Co., USA.

Schimmel, J. (2012). *Writing science*. Oxford University Press, USA.

Course Code	213103	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Animal diversity-1: Protozoa and Non-chordates			

Course Objectives:

This course, students will be introduced to Invertebrates. Emphasis will be placed on ontogeny, structure, and function of organ systems in an evolutionary context. This course aims to give students a more in-depth view of the Animal Kingdom, beginning with the invertebrates.

Course Learning Outcome (CLO):

After going through the course, students will be able to learn the following outcomes:

CLO1	Classify Invertebrate Phyla: Apply taxonomic principles to classify major invertebrate phyla, diagnosing key morphological, developmental, and organizational characteristics.
CLO2	Analyze Organ System Adaptations: Compare and contrast organ systems across model organisms to infer evolutionary adaptations to diverse habitats and conservation plan.
CLO3	Evaluate Ecological and Economic Roles: Assess the ecological significance and economic impact of key taxa in natural and human systems.
CLO4	Demonstrate Protozoan and Parasite Identification: Identify pathogenic protozoans and helminths using morphological keys and correlate them with human diseases with ethical view.
CLO5	Synthesize Evolutionary Relationships: Reconstruct phylogenetic relationships among radiate, acoelomate, and coelomate phyla using evidence from body plans, embryology, and fossil records.

Mapping of CLOs with PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	√	√								
CLO2	√								√	
CLO3					√			√		
CLO4		√	√							
CLO5				√		√				

Course Contents:

Topics	Teaching Learning Strategy	CLOs
1. General characters with examples of protozoans, mesozoans and parazoans; radiate, acelomate and pseudocelomate animals	Lecture, Assignment	CLO1 CLO2
2. Broad classification of the following phyla up to orders with general and diagnostic characteristics of each taxonomic category, with examples and affinities: a. Sarcomastigophora, b. Apicomplexa, c. Ciliophora, d. Porifera, e. Cnidaria, f. Platyhelminthes, g. Nematoda, h. Annelida, i. Mollusca, j. Arthropoda, k. Echinodermata and l. Hemichordata. Case Study 1: The Neglected Tropical Disease – Mapping and Managing Lymphatic Filariasis in Bangladesh	Lecture, Group Discussion, Assignment	CLO3 CLO4
3. Type study of the following with their systematic position, habitats, external morphology, organ systems such as food and feeding, digestion, movement, circulation, respiration, excretion, nervous, reproduction, and development: a. Phylum Sarcomastigophora: <i>Euglena</i> b. Phylum Ciliophora: <i>Paramecium</i> c. Phylum Porifera: <i>Scypha</i> d. Phylum Cnidaria: <i>Obelia</i> and <i>Aurelia</i> e. Phylum Ctenophora: <i>Hormiphora</i>	Lecture, Group Discussion, Workshop and Assignment	CLO4 CLO5

f. Phylum Platyhelminthes: <i>Taenia</i> , g. Phylum Nematoda: <i>Ascaris</i> h. Phylum Mollusca: <i>Pila</i> i. Phylum Annelida: <i>Neanthes</i> j. Phylum Onychophora: <i>Peripatus</i> k. Phylum Arthropoda: Prawn l. Phylum Echinodermata: <i>Astropecten</i> m. Phylum Hemichordata: <i>Balanoglossus</i>		
4. Brief notes on the following, including habit, habitats, food, feeding, breeding, and economic importance: a. Sarcomastigophora: <i>Opalina</i> , <i>Leishmania</i> , <i>Trypanosoma</i> b. Protozoa: <i>Monocystis</i> , <i>Toxoplasma</i> , <i>Nosema</i> c. Porifera: <i>Spongilla</i> , <i>Cliona</i> d. Cnidaria: <i>Adamsia</i> , <i>Physalia</i> , <i>Gorgonia</i> , <i>Pennatula</i> e. Platyhelminthes: <i>Fasciola</i> , <i>Schistosoma</i> , <i>Convoluta</i> , <i>Diphyllbothrium</i> and <i>Hymenolopis</i> f. Nematoda: <i>Ancylostoma</i> , <i>Enterobius</i> , <i>Wuchereria</i> , <i>Trichinella</i> , <i>Dracunculus</i> , <i>Loa</i> and <i>Trichuris</i> . g. Mollusca: <i>Sepia</i> , <i>Dentalium</i> , <i>Octopus</i> , <i>Neopilina</i> , <i>Chiton</i> , <i>Mytilus</i> , and <i>Nautilus</i> h. Annelida: <i>Tubifex</i> , <i>Lumbricus</i> , <i>Piscicola</i> and <i>Myzostoma</i> i. Arthropoda: <i>Limulus</i> , <i>Eupagurus</i> , <i>Squilla</i> , <i>Scolopendra</i> , beetles & weevils, moths & butterflies, termite, bug and bees j. Echinodermata: <i>Echinus</i> , <i>Cucumaria</i> and <i>Antedon</i>	Lecture, Group Discussion, Workshop and Assignment	CLO2 CLO4 CLO5
5. Ethics in Pathogen Research: One Health principles, benefit-sharing (Nagoya Protocol), animal welfare (3Rs: Replacement, Reduction, Refinement). Techniques of safe handling of vectors (mosquitoes, ticks) and host specimens (rodent blood/tissue). "Conservation Plan" for a Bangladeshi invertebrate (e.g., native bees) and Map approval workflow for collecting <i>Wuchereria</i> in neighborhoods of different colleges of the country. Case Study 2: The Unsung Pollinator – Developing a Conservation Plan for the Bangladeshi Stingless Bee	Case study and workshop	CLO1 CLO3 CLO4

List of Books:

- Atlas, R. M., & Maloy, S. (2014). *People, animals, and the environment*. American Society for Microbiology, USA.
- Barnes, R. S. K., Calow, P., Olive, P. J. W., Golding, D. W., & Spicer, J. I. (2002). *The invertebrates* (3rd ed). Blackwell Science, UK.
- Bayne, K., & Turner, P. V. (2013). *Laboratory animal welfare: Ethical considerations and 3Rs implementation*. Academic Press, Netherlands.
- Campbell, N., & Reece, J. (2005). *Biology* (7th ed.). Pearson, UK.
- Florin-Christensen, M., & Schnittger, L. (2018). *Parasitic protozoa of farm animals and pets*. Springer, Cham, Switzerland.
- Hemsley, R. N. (2022). *The Nagoya protocol on access and benefit-sharing in the light of the convention on biodiversity*. Nomos, Germany.
- Hickman, C. P., Keen, S. L., Eisenhour, D. J., Larson, A. & I'Anson, H. (2023). *Integrated principles of zoology* (19th ed). McGraw-Hill Co. Inc., New York, USA.
- Nigam, H. C. (2013): *Biology of non-chordates*. Vishal Publishing Co., India
- Parker, T. J., & Haswell, W. A. (2005). *Textbook of zoology*, Vol. I, Macmillan.
- Ruppert, E. E., Fox, R. S., & Barnes, R. D. (2006). *Invertebrate zoology* (8th ed.). Holt Saunders International edition, USA.

Course Code	213105	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Ecology			

Course Objectives:

In this course, students will be introduced to Ecological studies. Emphasis will be placed on understanding ecological principles and ecosystem functions, exploring interactions between organisms and their environments, analyzing population, community, and ecosystem dynamics, applying ecological knowledge to solve environmental problems, and developing skills in ecological research and data interpretation.

Course Learning Outcome (CLO):

After going through the course, students will be able to learn the following outcomes:

CLO1	Explain fundamental ecological concepts , including the scope of ecology, levels of organization, and interdisciplinary links, while analyzing the effects of environmental factors on organism distribution.
CLO2	Apply ecological principles such as limiting factors, population dynamics, and community structure to real-world ecological scenarios.
CLO3	Evaluate ecosystem processes , including energy flow, biogeochemical cycles, and biodiversity conservation strategies, using ecological sampling methods and biodiversity indices.

CLO4	Assess human impacts on ecosystems , including pollution, climate change, and land-use changes, and propose mitigation strategies using applied ecology and landscape management approaches.
CLO5	Utilize ecological modeling , GIS, and remote sensing techniques to analyze ecological data and interpret landscape patterns for sustainable ecosystem management.

Mapping of CLOs with PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	√								√	
CLO2		√	√							
CLO3					√	√				
CLO4								√	√	
CLO5							√			√

Course Contents:

Topics	Teaching Learning Strategy	CLOs
1. Introduction to Ecology: Scope, history, levels of organization, interdisciplinary links	Lectures, and Group discussions	CLO1
2. Principle of limiting factors: Liebig's law of the minimum; Shelford's law of tolerance. 3. Abiotic Factors: Light, water, soil, temperature, and their effects on organism distribution Case Study 1: The Salinization of the Sundarbans – A Hierarchy of Limiting Factors 4. Biotic Limiting Factors: Positive and negative interactions; Human impacts 5. Interaction of Multiple Factors: Synergistic effects (e.g., temperature + humidity in arthropods), Hierarchy of limiting factors (primary vs. secondary) 6. Adaptations: Morphological, physiological, and behavioral adaptations in various ecosystems	Lecture, Group Discussion, Assignments and tutorial sessions	CLO1 CLO2
7. Population Ecology: Characteristics, life tables, survivorship curves, growth models (exponential, logistic)	Lecture, Fieldwork / virtual labs / mini-projects	CLO2

8. Population Regulation: Density-dependent and independent factors, r- and K-selection theory		
9. Concepts of habitat and ecological niche: Ecological equivalent; character displacement; allopatry and sympatry; biological clock. 10. Community Ecology: Structure, species diversity, niche theory, keystone species, Succession (primary and secondary), ecotones, stratification Case Study 2: The Char Lands or newly formed islands – A Mosaic of Landscape Ecology and Succession	Lecture, Group Discussion, Workshop, and Presentation	CLO2
11. Ecosystem Ecology: Energy flow, food chains/webs, ecological efficiency, Bio-geo-chemical cycles (C, N, P, S, water); nutrient dynamics	Lecture, Group Discussion, Assignment	CLO3 CLO5
12. Ecological Methods: Field sampling, quadrat, transect, mark-recapture, estimation of biodiversity by different indices; Ecological modelling, GIS applications in ecology, remote sensing	Lecture, Group Discussion, Workshop, and Presentation	
13. Applied Ecology: Human impact, pollution, urban ecology, land-use change, conservation ecology, protected areas, endangered species, biodiversity hotspots 14. Landscape ecology: landscape structure (patches, corridors, matrix, network), concept of ecotope, landscape change (geomorphology, disturbances, plant and animal invasions), landscape function, landscape management, effects of animals in landscapes.	Lecture, Group Discussion	CLO4 CLO5
15. Global Change Ecology: Climate change, carbon footprint, mitigation strategies, ecosystem resilience, Transformation patterns of organic and inorganic pollutants in the terrestrial and aquatic ecosystems	Lecture, Group Discussion, and Assignment	CLO4

List of Books:

Begon, M., Townsend, C. R., & Harper, J. L. (2021). *Ecology: From individuals to ecosystems* (4th ed.). John Wiley & Sons Ltd, UK.

Cain, M. L., Bowman, W. D., & Hacker, S. D. (2020). *Ecology* (4th ed.). Sinauer Assoc. Inc., USA.

- Chapin, F. S., Matson, P. A., & Vitousek, P. M. (2012). *Principles of terrestrial ecosystem ecology* (2nd ed.). Springer, UK.
- Gurevitch, J., Scheiner, S.M., & Fox, G.A. (2020). *The ecology of plants* (3rd ed.). Sinauer Associates Inc. USA.
- Krebs, C.J. (2014). *Ecology: The experimental analysis of distribution and abundance* (6th ed.). Pearson Education Limited, UK.
- Likens, G.E. (2009). *Biogeochemistry of a forested ecosystem*. Cambridge University Press, UK.
- Odum, E. P., & Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.). Thomson Brooks/Cole Publishing Co., USA.
- Ricklefs, R.E. (2008). *The economy of nature* (6th ed.). W. H. Freeman, USA.
- Sher, A. A., & Molles, M. C. (2022). *Ecology: Concepts and applications* (9th ed.). McGraw Hill LLC, USA.
- Smith, T. M., & Smith, R. L. (2015). *Elements of Ecology*, Pearson Education, UK.

Course Code	213106	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Zoology Practical-I			

- Study of museum specimens:** Representative of all major non-chordate phyla (*Sycon*, *Physalia*, *Metridium*, *Adamsia*, *Arenicola*, *Tubifex*, *Metaphere*, *Tomopteris*, *Amphitrite*, *Lumbricus*, *Ancylostoma*, *Enterobius*, *Wuchereria*, *Trichinella*, *Dracunculus*, *Loa*, *Trichuris*, *Hirudo*, *Piscicola*, *Pheretima*, *Sipunculus*, *Fasciola*, *Schistosoma*, *Convoluta*, *Diphyllobothrium*, *Hymenolopis*, *Lingula*, *Dentalium*, *Chiton*, *Neopilina*, *Pila*, *Mytilus*, *Unio*, *Nautilus*, *Sepia*, *Loligo*, *Octopus*, *Eupagurus*, *Limulus*, *Millipedes*, *Centipedes*, *Palaemon*, *Antedon*, *Asterias*, *Echinus*, *Holothuria*, *Echinus*, *Ophiura*, *Cucumaria*)
- Study of permanent slides: Whole mount, body parts and various cells and invertebrate tissues (at least 20 slides to be studied):
 - Whole animals – representatives of protozoans, rotifers and arthropods.
 - Mouth parts of arthropods.
 - Parasites – nematodes and platyhelminthes.
 - Different larval forms of invertebrates.
 - Histological slides of invertebrates.
- 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. Major dissection**
 - a. Circulatory system of earthworm and prawn.
 - b. Nervous system of cockroach, grasshopper, prawn, *Pila* and *Lamellidens*.
 - c. Reproductive systems of earthworm, cockroach, grasshopper and prawn.
 - B. Minor dissection**
 - a. Digestive system of prawn, *pila* and *Lamellidens*
 - b. Nervous system of 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, collection of at least 10 samples, preserve, label and submit to the laboratory; and prepare a scientific report on the visit including Title, Abstract, Introduction, Materials and Methods, Results and Discussions, Acknowledgement, References (Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community).
8. Quantify zooplankton (e.g., *Daphnia*, rotifers) in three different water bodies by using hemocytometer to and compare the diversity calculating Simpson's and Shannon's indices and prepare a scientific report.

Distribution of Marks for First Year Final Examination

- | | |
|--|-----------------|
| 1. Major dissection (dissection 5 + display 2 + drawing and labeling 3) | = 10 marks. |
| 2. Minor dissection (dissection 3 + display 2 + drawing and labeling 2) | = 7 marks. |
| 3. Temporary mount (staining, mounting and display 4 + drawing and labeling 3) | = 7 marks. |
| 4. Spotting of museum specimens – 12 items (identification and classification 1 + diagnostic characteristics 1) | = 24 marks. |
| Invertebrate specimens (4 items) | 2×6 = 12 marks. |
| Whole mount slides (mouth parts, parasites, larvae) (2 items) | 2×3 = 6 marks. |
| Histological slides (2 items) | 2×3 = 6 marks. |
| 5. Appendages (detachment, placement and drawing on a Course sheet 3, labeling 1, displaying 1) | = 5 marks. |
| 6. Prepare a report by quantifying zooplankton (e.g., <i>Daphnia</i> , rotifers) in a water body by using hemocytometer to compare the diversity calculating | = 20 marks. |

Simpson's and Shannon's indices. (Experiment-6, Title-1, Abstract-2, Introduction-2, Materials and Methods-2, Results-3, Discussions-2, Acknowledgement-1, and List of Books-1)

7. Report writing on field visit = 17 marks.
(At least 10 preserved sample submission-7; Title and Abstract-2, Introduction-2, Materials and Methods-1, Results-2, Discussions-2, Acknowledgement and References-1)
8. Class records =10 marks.

List of Books:

Dales, R. P. (1981). *Practical invertebrate zoology*. Blackwell Scientific Publications. Oxford, UK.

Nybakken, J. W. (1996). *The diversity of invertebrates a laboratory guide*. Pacific Coast Version. Wm. C. Brown, USA.

Sleigh, M. (1989). *Protozoa and other protists*. Chapman and H. Inc. New York.

Starr, C., & Taggart, R. (1981). *Biology: The unity and diversity life*. Wadsworth Publ. Co. Belmont, California, USA.

Wallace, R. L., & Taylor, W. K. (1996). *Invertebrate zoology laboratory manual*. Prentice-Hall, USA.

Course Code	212807	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Chemistry-I			

Course Objective:

The course is designed for the student to impart and improve fundamental knowledge and aspects related to understand the fundamental physical, Organic and Inorganic chemistry topics. To develop and extend student's knowledge on state of matter, structure of atom, radiochemistry, chemical bonding, Liquid and Solution, chemical equilibrium, pH, aliphatic and aromatic hydrocarbons.

Course Learning Outcomes (CLOs):

After completing this course, students will be able to:

CLO1	Explain fundamental concepts of matter & atomic structure to describe the states of matter and their transitions, apply Avogadro's number, mole concept, and stoichiometry in chemical calculations and analyze atomic models and electronic configurations using quantum numbers and Aufbau principle.
CLO2	Understand chemical bonding & molecular structure to classify types of chemical bonds, predict molecular geometry using VSEPR theory and hybridization and compare valence bond theory (VBT) and molecular orbital theory (MOT).

CLO3	Analyze chemical reactions & equilibrium to differentiate between physical and chemical changes, balance redox reactions and determine oxidation states and apply Le Chatelier's principle to predict equilibrium shifts in reactions.
CLO4	Apply principles of physical chemistry to derive and apply gas laws, calculate colligative properties and interpret Raoult's & Henry's laws and determine pH, buffer capacity, and solubility product (K _{sp}) in acid-base systems.
CLO5	Classify & characterize hydrocarbons (aliphatic & aromatic) to name hydrocarbons using IUPAC nomenclature, compare reactivity of alkanes, alkenes, and alkynes and explain aromaticity, electrophilic substitution, and substituent effects in benzene derivatives.

Mapping of CLOs with PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	√									
CLO2	√								√	
CLO3	√		√	√						
CLO4	√		√		√					
CLO5		√						√		

Course Contents:

Topic		Teaching-Learning Strategy	CLOs
1.	State of Matter in Chemistry: Nature and classification of matter. Classical states of solid, liquid, gas and Liquid crystals, state of aggregation of matter. Changes of state of matter. Intramolecular and intermolecular force and their role for the determination of state of matter. Modern state as plasma. Avogadro's number with application, Concept of mole: calculation and importance. Stoichiometry.	Lecture, Group Discussion, Assignment	CLO1
2.	Structure of atom: Fundamental particles of atoms, Nucleus and discovery of nucleus, atomic model of Rutherford, Bohr atom model: postulates, limitations and success, Spectrum of atomic hydrogen, Dual nature of	Lecture, Group Discussion, Assignment	CLO1
	electron, Heisenberg uncertainty principle, Quantum numbers, atomic orbitals, Aufbau principle, Pauli exclusion principle, Hund's rule of maximum multiplicity, electronic configuration of atoms.		

3.	Radiochemistry: Atomic number and mass number, atomic mass unit, atomic nucleus, Isotopes, Nuclear stability, natural and artificial radioactivity, half-life and average life of radioelements, radioactive decay, nuclear reactions.	Lecture, Group Discussion, Assignment	CLO1
4.	Periodic table: Periodic law, 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.	Lecture, Group Discussion, Assignment	CLO2
5.	Chemical bond: Definition and causes chemical bonds, octet rule and duplet rule, types of chemical bonds: ionic, covalent bond, polar and non-polar bond, Ionic character of covalent compound and covalent character of ionic compounds VSEPR theory, Valence bond theory, Hybridization, σ and π -bonding in compounds, Molecular orbital theory, coordination, metallic, hydrogen bonds.	Lecture, Group Discussion, Assignment	CLO2
6.	Chemical Reactions: Physical change and Chemical change, Methods of bringing about chemical reaction, Redox reactions, oxidizing and reducing agents, oxidation state and oxidation number, redox half reactions, rules for balancing redox reactions, acid base reactions.	Lecture, Group Discussion, Assignment	CLO3
7.	Chemical Equilibrium: Equilibrium in chemical reactions. Stoichiometry, law of mass action, concentration Versus time curves, equilibrium law and equilibrium constant: K_p , K_c , and K_x , effects of temperature, pressure and concentration changes of equilibrium, principle and applications of Le Chatelier and Braun, reaction quotient, extent of reaction, thermodynamic equilibrium constant.	Lecture, Group Discussion, Assignment	CLO3

8.	Gaseous State: Vapour and gas, measurable properties of gases, determination of gas pressure, the gas laws: derivation, molecular explanation and practical applications, effusion, diffusion, osmosis, ideal and real gases, ideal gas equation with applications, kinetic theory of gas, deviation from ideal behaviour, Van der Waals equation, critical constants. Dalton's law of partial pressure.	Lecture, Group Discussion, Assignment	CLO4
9.	Liquids and Solutions: Liquids and their characteristics, evaporation, measurement vapour pressure, dependence of vapour pressure on temperature variation, boiling, distillation, Types of solution, solubility and solubility curve, units of concentration for solution, Raoult's law, ideal and non-ideal solutions. Henry's law. a brief treatment of colligative properties.	Lecture, Group Discussion, Assignment	CLO4
10.	pH and Buffer: Ostwald dilution law, solubility product with principle and applications, common ion effect, ionic product of water (K_w), pH with applications, buffer solution, buffer mechanism, Henderson-Hasselbach equation. Acid-base titrations, Acid-base indicators. Theories of acids and bases, conjugate acids and bases, neutralization reactions, acid-base strength, Salts: Classification and their applications, neutralization reactions.	Lecture, Group Discussion, Assignment	CLO4
11.	Aliphatic hydrocarbons: Organic compounds, homologous series, the causes of diversity of organic compounds, Hydrocarbons: classifications and IUPAC nomenclature. Formation of carbocations, carbanion, free radicals and their stabilities. Sources, properties, general methods of preparation of following hydrocarbons: Alkane, Alkene and Alkynes. Classification of organic compounds based on their functional groups.	Lecture, Group Discussion, Assignment	CLO5
12.	Aromatic hydrocarbons: Definition and classification, nucleus and side chain, Structure, preparation and uses of benzene. Aromaticity, Electrophilic aromatic substitution reactions with reference to nitration, halogenation, sulphonation and alkylation. Orientation of substituents in benzene ring, activating and deactivating group.	Lecture, Group Discussion, Assignment	CLO5

List of Books:

Bahl, B. S., & Bahl, A. (2024). *Text- Book of Organic Chemistry*. S. Chand & Company Ltd Ram Nagar, India.

English, J., & H. G Cassidy and Baird, R. I. (1949). *Principles of organic chemistry: An introductory text in organic chemistry*. McGraw Hill, USA.

Finar, I. L. (1973). *Organic chemistry, Vol. I*. Pearson Education, India.

Griffin, R. W. (2024). *Modern organic chemistry*. McGraw Hill, USA.

Morrison, R.T., & Boyd, R. N. (1992). *Organic chemistry*. Benjamin-Cummings Pub Co

Muny, J. Mc. (2010). *Organic chemistry*. Thomson Broks-Coole, Canada.

Robert, J. D., & Caserio, M. C. (1977). *Basic principles of organic chemistry*. W. A. Benjamin, Inc., Menlo Park, USA.

Skoog, D. A., & West, M. D. (2022). *Fundamental of analytical chemistry*. Publisher, Cengage Learning

Course Code	212808	Marks: 50	Credits: 2	Class Hours: 30
Course Title:	Chemistry -I Practical			

Course Objectives:

To gain a fundamental knowledge on laboratory safety policy, some inorganic salts and radical analysis, preparation of solution with standerization, titration and precipitation.

Course Learning Outcomes (CLOs):

After completing this course, students will be able to:

CLO1	Discuss about the general laboratory safety policy, rules and regulations and chemical management process.
CLO2	Explain the applications of apparatus and reagents in various experiments, different laboratory glassware and chemicals.
CLO3	Prepare stander solution and pH- neutralization curves
CLO4	Qualitative analysis of mixtures of inorganic salts consisting of up to five different radicals
CLO5	Explain to determination of Fe^{2+} , copper (II), nickel as Ni (HDMG) 2 complex 7 using difference methods.

Course Contents:

Topics		Teaching-Learning Strategy	CLOs
1	Safety: Introduction of chemical, equipment's and safety in the laboratory.	Lecture, Experimental, Assignment	1-5
2	Preparation: Preparation of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ Mohr's salt and potash alum.	Lecture, Experimental, Assignment	1-5
3	Separation and identification: 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^- .	Lecture, Group Discussion, Experimental, Assignment	1-5
4	Standardization: Standardization of NaOH solution using standard oxalic acid solution.	Lecture, Experimental, Assignment	1-5
5	Determination: Determination of Fe^{2+} using standard permanganate solution.	Lecture, Experimental, Assignment	1-5
6	Iodometric method: Iodometric determination of copper (II) using standard Na_2SO_3 solution.	Lecture, Experimental, Assignment	1-5
7	Gravimetric Method: Gravimetric determination of nickel as $\text{Ni}(\text{HDMG})_2$ complex.	Lecture, Experiment, Assignment	1-5
8	pH-Neutralization Curves: Determination of the pH-neutralization curves of a strong acid by a strong base.	Lecture, Experiment, Assignment	1-5

List of Books:

Alexeyev, V. (2024). *Qualitative analysis*. Mir Publishers, USSR.

Braun, D. R. (2024). *Introduction to chemical analysis*. McGraw Hill, USA.

Christian, G. D. (2023). *Analytical chemistry*. John Wiley & Sons, USA.

Vogel, A. I. (2017). *A Text-book of macro and semimicro qualitative inorganic analysis*. Longmans, Green and Co. Ltd.

Welcher, F. J., & Hahn, R. B. (2024). *Semimicro qualitative analysis*. D. Van Nostrand Co. Inc.

Course Code	213007	Marks:100	Credits: 4	Class Hours: 60
Course Title:	Botany -1			

Course Objectives:

This course aims to introduce non-major students to the fundamentals of plant biology, including the origin and evolution of life, and the key differences between plants and animals. It covers microorganisms, algae, lichens, and major plant groups such as bryophytes, pteridophytes, gymnosperms, and angiosperms, focusing on their classification, structure, reproduction, and economic importance. Students will also learn basic plant pathology and the significance of plants in daily life, including their uses in food, medicine, and industry.

Course Learning Outcome (CLO):

After going through the course, students will be able to learn the following outcomes

CLO1	Explain the diversity and evolution of life to describe the origin of life and evolutionary relationships among organisms, compare key differences between plants and animals in structure, function, and classification as well as apply modern taxonomic systems to classify living organisms.
CLO2	Analyze microbial and fungal systems to classify viruses, bacteria, fungi, and cyanobacteria based on structure, reproduction, and ecological roles; explain the economic importance of microbes and illustrate the life cycles of representative species.
CLO3	Evaluate plant diversity and adaptations to compare the morphology, reproduction, and habitats of bryophytes, pteridophytes, gymnosperms, and angiosperms; identify diagnostic features of key plant families and their economic uses and relate plant adaptations to their environments.
CLO4	Diagnose plant diseases and their impacts to analyze the causes, symptoms, and control of major plant diseases, apply pathology principles to disease forecasting and management in agriculture and evaluate the economic and ecological consequences of plant diseases.
CLO5	Apply economic botany principles to identify locally and globally significant plants for food, medicine, timber, fiber, and oil; explain the cultivation and processing of economically vital crops and advocate for sustainable use of plant resources in conservation and industry.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	√	√								
CLO2		√	√						√	
CLO3	√	√			√					
CLO4					√				√	
CLO5					√				√	√

Course Contents:

Topics	Teaching-Learning Strategies	CLOs
1. Introduction: Origin and evolution of life; differences between plants and animals; modern concepts of classification of living organisms.	Lecture, PPT, Discussion	CLO1
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 <i>Saccharomyces</i> . e. Cyanobacteria: Habitat, characteristics, structure, importance of Cyanobacteria. f. Algae: Habitat, characteristics, classification up to class (Fritsch), reproduction, importance; life history of <i>Oeodogonium</i> . g. Phytoplankton: Habitat, characteristics, classification and importance.	Lecture, Group discussion, Video presentations	CLO2
3. Lichen: Habitat, characteristics, classification and importance.	Illustrated lecture, Model demonstration	CLO2
4. Limnology: Definition, scope, importance and classification of lakes.	Chalk-talk, Diagrams, Group activities	CLO3

5. Bryophyta: Habitat, characteristics, classification up to classes and reproduction; life history of Riccia and Anthoceros.	Lecture with images, Case studies	CLO3
6. Pteridophyta: Habitat, characteristics, classification up to classes, importance; life history of Selaginella and Christella.	Hands-on lab, Lecture	CLO5
7. Gymnosperms: Habitat, characteristics and importance; life history of Cycas and Gnetum.	Illustrated discussion, Lab demo	CLO4
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.	Field visit, Family specimens	CLO6
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, blast disease of rice, tungro disease of rice, bacterial blight of rice, stem rot of jute, anthracnose of chilli, citrus canker and soft rot of jackfruit.	Case studies, Lecture, Sample study	CLO7
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) fiber, (e) oil and (f) vegetables. Cultivation and processing of tea and rubber.	Case studies, Lecture, Sample study	CLO7

List of Books:

- Agrios, G. N. (2020). *Plant pathology* (6th ed.). Academic Press, USA.
- Lampert, W., & Sommer, U. (2023). *Limno-ecology: The ecology of lakes and streams* (3rd ed.). Oxford University Press, UK.
- Ranker, T. A., & Haufler, C. H. (Eds.). (2020). *Biology and Evolution of Ferns and Lycophytes*. Cambridge University Press, UK.
- Shaw, A. J., & Goffinet, B. (Eds.). (2020). *Bryophyte Biology* (2nd ed.). Cambridge University Press, UK.
- Simpson, M. G. (2019). *Plant systematics* (3rd ed.). Academic Press, USA.
- Singh, G. (2021). *Plant Systematics: An integrated approach* (5th ed.). China.
- Webster, J., & Weber, R. (2019). *Introduction to fungi* (4th ed.). Cambridge University Press UK.

Course Code	213008	Marks: 50	Credits: 2	Class Hours: 30
Course Title:	Botany -I Practical			

Course Objectives:

The practical component of this course aims to provide foundational skills in identifying major plant groups and microorganisms to the students. They will learn to examine structural features of algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Emphasis is placed on understanding the economic importance of plants and recognizing common plant diseases through specimen observation. Basic techniques, e.g., slide preparation, microscopic analysis, and scientific drawing, will also be practiced.

- Detail study including dissection (where necessary), mounting, drawing, description and identification with classification of the following genera: 10

Cyanobacteria:	<i>Nostoc, anabaena</i>
Algae:	<i>Saccnaromyces and Accoboious</i>
Bryophyte:	<i>Riccia and Marchantia</i>
Pteridophyte:	<i>Selaginella, Christella</i>
Gymnosperms:	<i>Cycas</i>
Angiosperm:	Poaceae and Fabaceae
- Identification of the following genera with reasons: 06

Algae:	<i>Volvox, Polysiphonea and Fucas.</i>
Fungi:	<i>Rhizopus, Agaricus, Puccinia and Penicillium.</i>
Lichen:	<i>Crustose, Foliose and Fructose.</i>
Bryophyte:	<i>Anthoceros, Semibarbula.</i>
Pteridophyte:	<i>Selaginella, Marsilea, Azolla and Pteris</i>
Gymnosperms	Male and female cones of <i>Cycas</i>
Angiosperms:	Scientific names of common plants around the institution.
- Find out algal specimens from local fresh water sample; draw and describe 05
- Study the symptoms and causal organisms of brown spot of rice and stem rot of Jute. 05
- Detailed taxonomic study of the families as included in the theory syllabus. 08
- Study of plant and plant parts, and economic uses of angiosperms included in the syllabus. 06
- Preparation of herbarium specimens of local plants and submission during examination. 05
- Laboratory Notebook. 05

List of Books:

Agrios, G. N. (2020). *Plant pathology* (6th ed.). Academic Press, USA.

Hill, F. A. (1972). *Economic botany*. Tata McGraw-Hill Publishing Company, India.

Mukherji, H., & Ganguly, A. K. (2000). *Plant groups*. Central Book Agency, Philippines

Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (1993). *Microbiology: Concepts and applications*. McGraw-Hill Inc, USA.

Vashishta, P. C. (1993). *Botany for degree students: Pteridophyta*. S. Chand & Company Ltd, India.

Paper Code:	219901	Marks: 100	Credits: 4
Paper Title:	History of Bangladesh: Language, Culture, and Identity		Hours: 60

Course Objectives:

This course is designed to help undergraduate students from diverse academic backgrounds develop a comprehensive and nuanced understanding of the historical development of Bangladesh, with a particular focus on its language, culture, and identity. By critically examining a variety of historical events, socio-political movements, and cultural shifts from ancient times to the contemporary period, students will have the opportunity to trace the evolution of the Bengali nation. The course aims to foster informed citizenship through an exploration of the Liberation War, identity formation processes, cultural heritage, the lives and contributions of key political figures, and the roles of ethnic minorities. Ultimately, the objective is to equip learners with the intellectual tools necessary to contextualize current national debates and to recognize the role of youth and globalization in shaping the future of Bangladesh.

Course Learning Outcomes:

At the end of the course, learners will be able to:

CLO1	Recall key historical events, dates, movements, personalities, and cultural developments that contributed to the emergence of Bangladesh from the pre-colonial period to the present day.
CLO2	Demonstrate an understanding of the socio-political, linguistic, and cultural influences that shaped Bengali identity and nationalism, emphasizing the Language Movement, Liberation War, and subsequent democratic uprisings.
CLO3	Apply their historical and cultural understanding to interpret contemporary national issues and debates relating to identity, political reform, and cultural transformation in Bangladesh.
CLO4	Analyze how historical events, political ideologies, and social changes are interconnected in shaping the current socio-political landscape of Bangladesh, with a particular emphasis on the roles of movements, minorities, and the youth.

Course Contents:

Topics	Teaching Learning Strategy	CLOs
1. Pre-colonial Era <ul style="list-style-type: none"> • Life and Culture of the People in Ancient Bengal • Bengal Under Muslim Rulers: Society, Culture, and Religion • Role of the Sufis in Preaching Islam and Impacts of • Sufism on the Bengali Society • Bengali Society and Culture in the Writings of Foreigners 	Interactive lectures	CLO 1-2
2. Colonial Era (18th and 19th Century) <ul style="list-style-type: none"> • The Battle of Plassey (1757) and the Beginning of British Colonialism • Bengal Renaissance • Reforms in Hindu Society • New Forms in Bengali Literature and Culture • The Muslim Response to Western Education 	Interactive lectures, reading, and assignments	CLO 1-2
3. Colonial Era (First Half of the 20th Century) <ul style="list-style-type: none"> • Partition of Bengal (1905) • Hindu-Muslim Disagreements • Formation of the All India Muslim League (AIML) • Muslim Shahitya Samaj • Buddhir Mukti Andolan: The Urge for Rational Thinking in Bengali Muslim Society • Growth of Religion-based Identity • Politics of Hindutva and the Two-Nation Theory • Spread of Communalism in Society • The Partition of India and Bengal 	Interactive lectures and group discussions	CLO 2-3
4. Post-Partition Era (1947-1971) <ul style="list-style-type: none"> • Language Movement • Political, Economic, and Cultural Aspects • Growth of Vernacular Nationalism • Cultural Activism 	Interactive lectures and group discussion	CLO 2-3

<p>5. Changing Bengali Identity</p> <ul style="list-style-type: none"> • The Evolution of Bengali Identity in the Context of Language, Culture, and Religion • From Ancient Times to the Present • The Role of the Bengali Language in Shaping Identity • The Language Movement of 1952 and Its Long-term Impact on National Consciousness • The Influence of Religion on Bengali Identity • The Impact of Socio-political Movements on Identity Formation • The Liberation War of 1971 • Contemporary Debates on Bengali Identity • The Role of Youth in Redefining Identity • The Influence of Globalization 	<p>Interactive lectures and thematic assignments</p>	<p>CLO 2-3</p>
<p>6. Liberation movement of 1971 and mass uprising till 2024</p> <ul style="list-style-type: none"> • The Political and Economic Exploitation of East Pakistan by West Pakistan • Six (6) Points Movement, Uprising of 1969 • The 1970 General Elections • The Non-cooperation Movement and the Declaration of Independence • The Role of AK Fazlul Haque, Huseyn Shaheed Suhrawardy, Maulana Bhashani, Sheikh Mujibur Rahman and Ziaur Rahman • The Liberation War of 1971 • Genocide and Resistance • The Role of the Mukti Bahini • Post-independence Challenges • Nation-building • Political Instability • Mass Uprisings and Democratic Movements • The Anti-autocracy Movement of the 1980s • The 1990s Movement for Democracy and Afterwards • The 2024 Movements for Political and Social Reforms 	<p>Interactive lectures, group discussions, and thematic assignments</p>	<p>CLO 1, 3, 4</p>

7. History of Other Ethnic Groups <ul style="list-style-type: none"> • The Indigenous Communities of Bangladesh • Historical Presence • Cultural Practices • Land Rights and Cultural Assimilation • Contributions and Sacrifices • Political Representation of Ethnic Minorities 	Interactive lectures and group discussions	CLO 4
8. Cultural Heritage and Modern Transformations <ul style="list-style-type: none"> • The Evolution of Bengali Culture • From Ancient Traditions to Modern Expressions • The Role of Literature, Music, and Art in Shaping Bengali Identity • Contributions of Rabindranath Tagore, Kazi Nazrul Islam, and Other Cultural Icons • The Impact of Globalization on Bengali Culture • The Revival of Traditional Arts • The Role of Youth in Cultural Innovation Urbanization • Environmental Changes • The Commodification of Culture 	Interactive lectures, documentary screening, and thematic assignments	CLO 1-4

List of Books:

- Ahmed, M. (1979). *Bangladesh: The constitutional quest for autonomy*, Dhaka: University Press Limited.
- Ahmed, R. (1981). *The Bengal Muslims 1871-1906: A quest for identity*. Oxford University Press.
- Alavi, H. (1972). *The state in post-colonial societies: Pakistan and Bangladesh*. In K. Gough & 11. P. Sharma (Eds.), *Imperialism and revolution in South Asia* (pp. 145-178). New York, NY: Monthly Review Press.
- Bernier, F. (2023). *Travels in the Mogul Empire: A.D. 1656-1668*. Chennai: Atlantic Publishers.
- Bleie, T. (2005). *Tribal peoples, nationalism, and the human rights challenge*. The Adivasis of Bangladesh. University Press Limited.
- Bosc, S. (2011). *Dead reckoning Memories of the 1971 Bangladesh war*. Hurst & Company.
- Eaton, R. M. (1996). *The rise of Islam and the Bengal frontier. 1204-1760*. Berkeley: University of California Press.
- Gilmour, D. (2019), *The British in India: Three centuries of ambition and experience*. London. Penguin.
- Halim, S., Amanullah, A. S. M., & Nasir, R. 1. (Eds.). (2024). *Society and sociology in Bangladesh: A South Asian perspective*. The University Press Limited.

- Hashmi, T. (2021). *Fifty Years of Bangladesh, 1971-2021 Crises of Culture, Development, Governance and Identity*. Switzerland: Palgrave Macmillan.
- Huq, M. E. (1975). *History of Sufism in Bengal*. Dhaka. Bangladesh Asiatic Society
- Husain, I. (2014). *Karl Marx on India*. New Delhi: Tulika Books.
- Jahan, R. (1972). *Pakistan: Failure in national integration*. New York, NY: Columbia University Press.
- Maniruzzaman, T. (1988). *The Bangladesh revolution and its aftermath (2nd ed.)*. Dhaka: University Press Limited. (Original work published 1980)
- Mascarenhas, A. (1986). *Bangladesh: A legacy of blood*. London: Hodder and Stoughton.
- Rashid, H. O. (2015). *The foreshadowing of Bangladesh: Bengal Muslim League and Muslim politics* (3rd ed.). Dhaka: University Press Limited.
- Roy, A. (1984). *The Islamic syncretistic tradition in Bengal*. Princeton, NJ: Princeton University Press.
- Sen, A. (2006). *Identity and violence: The illusion of destiny*. W. W. Norton & Company.
- Umar, B. (2022). *The Emergency of Bangladesh: A History of East Pakistan*. Dhaka: Bangla Gobeshona.

Course Code	219903	Marks: 75	Credits: 3
Course Title:	Information and Communication Technology		

Course Objectives:

The main objective of the course is to develop students' understanding and skills in using, managing, and applying technology to solve problems and enhance various aspects of life and work. Key areas of focus include understanding ICT systems, software, hardware, networks, and their applications.

Course Learning Outcomes: The student will be able to:

CLO 1	Explain foundational ICT concepts, including the information processing cycle.
CLO 2	Operate standard computer hardware and software systems effectively.
CLO 3	Use office productivity tools (Word, Excel, PowerPoint) for academic and professional tasks.
CLO 4	Apply safe internet practices and use internet tools for communication and information retrieval.
CLO 5	Understand and explain the concepts of Data Analytics, Artificial Intelligence (AI), and Machine Learning (ML)
CLO 6	Understand the concept of free-lancing

Course Contents:

Unit	Specific Objectives	Content	Teaching and Learning Approach
Unit 1: Introduction to Information and Communications Technology (ICT) and Computer System	The student will be able to: <ul style="list-style-type: none"> • Explain the concept of ICT and its related terminologies. • Describe the information processing cycle. • Analyze the impact of ICT on educational, social and economic development. • Identify career opportunities in ICT education. • Differentiate among the classes of computers and the usages of them. • Identify the vital components of the Systems Unit. 	Definition of ICT, basic concepts and terminologies. Data, Information Application of ICT, Advantages and Disadvantages of ICT, Impact of ICT Career opportunities in ICT education Information Processing Cycle. Classification of Computers The Vital Components of the Systems Unit.	Classroom Lectures
Unit 2: Computer Hardware and Software	The student will be able to: <ul style="list-style-type: none"> • Describe the categories of Computer Hardware. • Describe the commonly used Input and Output devices • Identify the main processing devices, storage devices and media. Identify the main communication devices. • Identify types of Software packages. • Distinguish between an Operating System and Application software. • Identify different types, examples and uses of Operating Systems and Application software 	Categories of Computer Hardware: Input devices, Processing devices, Output devices, Storage devices Communication devices, Main Processing Devices: The Processor, Control Unit and Arithmetic and Logic Unit Software Packages, Operating Systems, Types and uses of Operating Systems, Types and uses Application Software: Educational software, Games software, Graphics software Browsers: Internet explorer, Google chrome, Mozilla Firefox, Opera, Internet explorer, Mozilla Firefox;	Classroom lectures and Lab

	<ul style="list-style-type: none"> • Distinguish between Open Source and Proprietary Software. 	Proprietary and Open Source Software	
Unit 3: Introduction to Word Processing Application	<ul style="list-style-type: none"> • The student will be able to: • Identify Word Processing packages. • Create and save a document using the Word Processor. • Format a Word document using formatting tools. Demonstrate the ability to perform collaborative editing. • Insert tables in a Word Processing document. • Insert symbols and pictures in Word Processing documents. • Use layout techniques in document creation. • Inserting headers and footers. • Print documents using the various print options. 	<p>Word Processing Packages and Their Uses. Introduction of Microsoft Word Software.</p> <p>File creation and saving: New, Save, Open, Save As.</p> <p>Editing: Copy/Cut, Paste, Undo, Redo, Find, Replace, Clipboard, Sub-Headings And Paragraphs, Text Correction, Wrapping Text, Text Orientation</p> <p>Formatting: Font: Style, Size, Color, Bold, Underline, Italic, Superscript, Subscript, Shadow, Strikeout. Paragraph: Alignment, Bullet & Numbering, Indent, Line Spacing, Table Border</p> <p>Insert: Table, Picture, Shape, Smart Art, Chart, Header, Footer, Page Number, WordArt, Drop Cap, Symbols, Equations, Hyperlink, Comment.</p> <p>Page Design: watermark, page border Layout: Page setup, print</p>	Classroom Lectures, Lab, and Hands-on Practice
Unit 4: Spreadsheet Application	<ul style="list-style-type: none"> • The student will be able to: • Identify Spreadsheet Packages. • Explain the importance of the Spreadsheet application in data management. • Explain related concepts and terminologies in the 	<p>Spreadsheet Packages, e.g. Excel. Importance of Spreadsheet application in Data Management, Related Concepts and Terminologies (e.g., cell(s), rows, columns, worksheet, workbook)</p> <p>Excel Tool Bars: Formatting Bar, Standard Bar, Formula Bar.</p>	Classroom Lectures, Lab and Hands-on Practice

	<p>Spreadsheet.</p> <ul style="list-style-type: none"> • Identify features in the Spreadsheet application window. • Create and save a Workbook. • Construct and insert simple formulae and functions. • Format the worksheet using formatting tools. • Printing a worksheet. 	<p>Types of Data and Their Uses (e.g., number, date, text, currency), Creating and Saving a Workbook, Formula and Functions, Sorting, filtering, validation, creating pivot table.</p> <p>Formatting Worksheet Using Formatting Tools.</p> <p>Draw Graph/chart, Printing Worksheet.</p>	
Unit 5: Presentation Application	<ul style="list-style-type: none"> • The student will be able to: • State the importance of the Presentation application. • Identify the commonly used features of a Presentation application while prepare a presentation. • Create and save presentations using a template, Add new slide(s). Edit text, Format text, Insert objects, images and pictures, Run slide show, Apply transition, animation effects to slides • Select the print option for printing. • Prepare a presentation on a selected topic and present it. 	<p>Presentation Applications Packages, Devices used for Presenting, Importance of Presentation Application, Principles for Designing Presentations, Terminologies in Presentation</p> <p>Application (eg, , Slide transitions, Slide show, etc.),</p> <p>Commonly Used Features of Presentation Application Window: Toolbars, Different presentation view modes</p> <p>Prepare a Presentation: Slide creating, editing, theme, background, inserting elements (image, audio, video hyperlink, table, smart art, graph, etc.) and formatting slides, Slide Layout, slide Show, slide transition, animation Effects.</p> <p>Selection of Print Option: Entire presentation, Specific slides, Handouts, Notes pages, outline view of slides.</p>	Classroom Lectures, Lab and Hands-on Practice
Unit 6: Privacy and Security	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Understand the basics of digital security • Use some security tools. 	<p>Introduction to Information Security, cybercrime, DoS and DDoS Attack, Key Management, Digital Signature and Certifications,</p>	Classroom Lectures, Lab and Hands-on Practice

	<ul style="list-style-type: none"> Understanding digital ethics. 	privacy, Data Security, Vulnerability, Threat and Risk, Malware, Social Engineering, Hacking, Plagiarism, Fishing, Software Piracy, Worms and Viruses, Spam, Adware, Malware, Spyware, Antivirus Software Ethics in the digital world	
Unit 7: Using The Internet to Communicate and Accessing Information	<ul style="list-style-type: none"> The student will be able to: Explain basic concepts, requirements, and terminologies of the Internet Apply the rules and regulations in the use of the internet. Using email Use the internet social network to communicate. Use Uniform Resource Locators (URLs) to access Information. Use search engines to access information Upload files to virtual drives and work on it. 	Internet, Intranet, Extranet, IP Address, Masking, MAC Address, Internet Services, OSI Reference Model, TCP/IP protocol stack, IPv4, IPv6, subnet Masking, MAC Address, Internet Services, Network Configuration and Troubleshooting, Wi-Fi, Broadband, Email Usage. Rules and Regulations in the Use of the Internet: Spam-Unsolicited Emails, People's Privacy, Intellectual Property Rights, etc. E-mail: Creating an Email Account, Sending, Accessing Email Messages, Attaching Documents to Email Messages, Using the Internet: Social Networks to Communicate, Uniform Resource Locators (URLs) to Access Information, Using Search Engines, Downloading Information from the Internet. Transferring Information from the Internet to a Different Application Intellectual Property Rights, ICT Policy, Software Piracy etc. Using Cloud Space: Google Drive, Google Workspace, OneDrive, Dropbox, etc.	Classroom Lectures, Lab and Hands-on Practice

Unit 8: Emerging Technologies: Data analytics, Artificial intelligence, Machine learning	<ul style="list-style-type: none"> • Define Data Analytics, Artificial Intelligence (AI), and Machine Learning (ML). • Understand how data is collected, processed, and used for decision-making. • Recognize the role of AI and ML in everyday life. • Explain basic differences between AI and ML. • Discuss benefits and challenges of these technologies. • Recognize current trends and career opportunities in these fields. 	<p>Introduction to Data Analytics: Define Data, Types of Data, Define Data Analytics, Basic Steps in Data Analytics, Applications of Data Analytics, Common Tools of Data Analytics (Excel, Tableau, Power BI, Python, SQL, etc.).</p> <p>Artificial Intelligence (AI): Define AI, Objectives of AI, AI capabilities, AI applications (NLP, Image Recognition, Predictive Analytics, Recommender Systems, Robotics, etc.); AI Tools: OpenAI GPT, TensorFlow, PyTorch, Keras, Scikit-learn, etc.), AI in daily life (Voice assistants, facial recognition, GPS route suggestions, chatbots, etc.).</p> <p>Machine Learning (ML): Define Machine Learning (ML), How It Works, Classification of ML, applications of ML, and common ML platforms (Teachable Machine, TensorFlow, PyTorch, Microsoft Azure Machine Learning, etc.).</p> <p>Relationship Between Data Analytics, AI, and ML</p> <p>Benefits & Challenges of Data Analytics, AI, and ML. Future Trends & Career Paths.</p>	Classroom Lectures, Lab and Hands-on Practice
Unit 9: Introduction to Freelancing	The student will be able to: <ul style="list-style-type: none"> • Define and explain the fundamental concept and 	Introduction and Basic Concepts, Fields of Freelancing, Essential Skills	Classroom Lectures, Practical

	<p>significance of freelancing in the global context.</p> <ul style="list-style-type: none"> • Identify and categorize various online marketplaces and professional fields. • Develop professional profiles, portfolios, and proposals suitable for freelancing platforms. • Demonstrate the use of online payment systems and financial transaction methods. • Analyze and evaluate strategies for career development and effectively apply techniques to overcome freelancing challenges. 	and Preparation, Introduction to Freelancing Marketplaces, Creating Profile and Portfolio, Earning and Transaction Process, Building a Freelancing Career, Challenges and Solutions.	Demos, Assignments, Discussions
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List of Books:

Norton, P. (2008). *Introduction to computers* (9th ed.). The McGraw-Hill.

Comer, D. E. (2018). *The internet book: Everything you need to know about computer networking and how the internet works* (5th ed.). Chapman and Hall/CRC Press.

Lambert, J., & Frye, C. (2015). *Microsoft Office 2016 step by step*. Microsoft Press.

Hassan, N. A., & Hijazi, R. (2017). *Digital privacy and security using Windows: A practical guide*. Apress.

Maheshwari, A. (2024). *Data analytics made accessible*. Jay Cobb.

Russell, S. J., & Norvig, P. (2020). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Alpaydin, E. (2020). *Introduction to machine learning* (4th ed.). MIT Press.

Course Code	219904	Marks: 25	Credit: 1
Course Title:	Lab: Information and Communication Technology		

Course Objectives:

The main objective of the course is to teach the students' understanding and skills in using, and applying technology to solve problems and enhance various aspects of life and work. It includes assembling

hardware, installing software, preparing PPT slides, and producing Word and Excel documents.

Course Learning Outcomes:

The student will be able to:

CLO 1	Learn assembling hardware
CLO 2	Prepare, edit and print Word documents and excel
CLO 3	Prepare Power Point presentation.
CLO 4	Access information from Internet, e-mail
CLO 5	Installation of anti-virus software
CLO 6	Data collection, Prediction, Pattern recognition, classification
CLO 7	Exploring markets, Proposal writing, Simulation strategies

List of Experiments

CLO Addressed	Unit	Experiments	Teaching Learning Approach
CLO1	1-4	<ul style="list-style-type: none"> Assemble different hardware Install different software Operate the computer - Drive, folder and file management Maintenance 	Lab and Hands-on Practice
CLO 2	3	Word <ul style="list-style-type: none"> Prepare a Word document on a specific topic (e.g, routine, question paper, CV, reports, applications) Formatting the document (Alignment, table, border, watermark, etc.), e.g., newspaper article, academic report, or documentation used in daily life, book, poster Print documents with different paper and printers 	Lab and Hands-on Practice
CLO 2	4	<ul style="list-style-type: none"> Excel Prepare a grade sheet Prepare a family expenditure Prepare a business expenditure report Prepare payroll management, with a report Create graphs on the given data Print Excel files 	Lab and Hands-on Practice
CLO 3	5	Power point	Lab and Hands-

		<ul style="list-style-type: none"> • Prepare an academic presentation on a specific topic. • Formatting the slides & using different tools. • Apply animation and transition • Print PPT files in different modes: Hand note, Slides shorter, outline 	on Practice
CLO4	6	<ul style="list-style-type: none"> • Install antivirus software, e.g., Norton Antivirus, McAfee, Kaspersky, Avast. 	Lab and Hands-on Practice
CLO5	7	<ul style="list-style-type: none"> • Use of email • Access information from the internet, use a search engine. • Use of virtual drive for collaboration • Google Meet 	Lab and Hands-on Practice
CLO6	8	<ul style="list-style-type: none"> • Data Collection and Visualization (Excel) • Simple Prediction (Excel) • Pattern recognition (Teachable Machine) • Classification (Teachable Machine) 	Lab and Hands-on Practice
CLO7	9	Free lancing <ul style="list-style-type: none"> • Marketplace exploration and portfolio creation • Proposal writing • Payment simulation 	Lab, Hands-on, Group Work, Discussion

Instructions for the Lab:

1. Lab sessions should be hands-on, with students engaging in tasks like assembling hardware, installing software, and using office tools.
2. Software like Microsoft Word, Excel, PowerPoint, and Teachable Machine will be used for document creation, data analysis, and basic machine learning.
3. Labs also include antivirus installation, email use, and online collaboration via Google Meet and Drive, emphasizing teamwork and problem-solving.

Instructions for the Lab exam:

1. The lab exam is individual. Students must answer two out of seven questions.
2. Marks distribution: Experiment (20 marks, 10 for each) for practical tasks, Viva-Voce (5 marks) for oral assessment. Total: 25 marks.

List of Books:

Comer, D. E. (2018). *The internet book: Everything you need to know about computer networking and how the internet works* (5th ed.). Chapman and Hall/CRC Press.

Lambert, J., & Frye, C. (2015). *Microsoft office 2016 step by step*. Microsoft Press