NATIONAL UNIVERSITY

BANGLADEH

Department of Botany

Four-Year B.Sc. Honours Course
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 on 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.

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

4. Programme Educational Objectives (PEOs):

PEO-1: To equip graduates in botany with the appropriate abilities to navigate a wide range of circumstances in an integrative and multimodal context, including analytical skills, creativeness, self-drive, and the pursuit of outstanding performance.

PEO-2: To prepare graduates with entrepreneurial competence across various domains and the professional skills required to be globally employable in government, private, and research institutions for achieving Sustainable Development Goals (SDGs) of Bangladesh.

PEO-3: To generate graduates with advanced expertise in Botany, equipped to solve complex scientific and environmental.

PEO-4: To foster graduates with strong moral leadership and teamwork abilities, dedicated to achieving individual excellence and organizational success.

5. Programme Learning Outcomes (PLOs):

Botany Graduates will be able to:

PLO-1: Knowledge: Apply fundamental and specialized knowledge of plant sciences to understand and address environmental challenges.

PLO-2: Scientific Analysis & Critical Thinking: Identify, analyze, and interpret complex biological problems by applying botanical principles and scientific reasoning to formulate effective, evidence based solutions.

LO-3: Innovative Solution Design: Design scientific strategies and develop effective solutions to botanical and environmental problems, considering health, safety, and sustainability aspects.

PLO-4: Conduct investigations of problems: Conduct research-based investigations, including experimental design, data analysis, and interpretation, to draw logical conclusions.

PLO-5: Proficiency in Modern Tools & Technologies: Utilize contemporary tools, digital platforms, and laboratory instruments in plant research, adapting to technological advancements while understanding their scope and limitations.

PLO-6: Social Awareness & Health Perspective: Apply scientific understanding to evaluate societal and health-related issues, fostering a sense of responsibility toward community well-being and environmental stewardship.

PLO-7: Environment and sustainability: Assess the effects of expert technological remedies on the environment and society, and exhibit an awareness of and commitment to environmentally friendly growth.

PLO-8: Professional Ethics: Adhere to professional ethics, obligations, and scientific practice standards by putting ethical concepts into practice.

PLO-9: Individual and teamwork: Work effectively both independently and as part of multidisciplinary teams, demonstrating leadership, adaptability, and interpersonal skills in collaborative environments.

PLO-10: Communication: Professionally communicate scientific operations to the scientific field and the general population by understanding and producing quality reports and design documentation, giving and receiving precise instructions, and making effective presentations.

PLO-11: Leadership & Project Management: Exhibit project management skills and leadership qualities by planning, organizing, and executing research or community-based initiatives in diverse professional settings.

PLO-12: Life-long Learning: Demonstrate the motivation and capability to pursue continuous learning, staying updated with scientific advancements and adapting to emerging challenges in the field.

7. Mapping PEO with PLO:

PLOs \ PEOs	PEO-1(Skills, creativity, excellence)	PEO-2(Entrepreneurship, global employability, SDG)	PEO-3(Scientific & environmental expertise)	PEO-4(Leadership, ethics, teamwork)
PLO-1 Knowledge	√	√	√	
PLO-2 Scientific Analysis	√	√	√	
PLO-3 Innovative Solution Design	√	√	√	√
PLO-4 Conduct Investigations	√	√	√	√
PLO-5 Modern Tools & Technology	√	√	√	√
PLO-6 Social Awareness & Health		√	√	√
PLO-7 Environment & Sustainability		√	√	
PLO-8 Professional Ethics		√		√
PLO-9 Individual & Teamwork	√	√		√
PLO-10 Communication	√	√		√
PLO-11 Leadership & Project Management	√	√		√
PLO-12 Life-long Learning	√	√	√	√

Year-wise Papers and Marks Distribution

First Year

Paper Code	Paper Title	Marks	Credits
213001	Microbiology	100	4
213003	Mycology	100	4
213005	Phycology	100	4
213006	Practical-I (Microbiology, Mycology, and Phycology)	100	4
212807	Chemistry-I	100	4
212810	Chemistry Practical -1	50	2
213107	Zoology-I	100	4
213108	Zoology Practical–I	50	2
219901	History of Bangladesh: Language, Culture and Identity	100	4
219903	Information and Communication and	75	3
219904	Lab, Information and Communication and	25	1
	Total=	900	36

Detailed Syllabus

Paper Code	213001	Marks: 100	Credits: 4	Class Hours: 60
Paper Title:	Microbiology			

Course Objectives:

This course offers a comprehensive overview of microbial organisms, emphasizing their structure, function, and evolutionary relationships, particularly in the context of disease and its management. Students will explore fundamental topics such as microbial cell structure and function, development, systematics, and evolution. Students also will gain a solid foundation in microbiology, equipping them with the theoretical knowledge and practical expertise needed for advanced research, academic progression, and employment in microbiology, biotechnology, food science, pharmaceuticals, and public health sectors.

Course Learning Outcome (CLOs):

After going through the course, the student would be able to learn the following outcomes

CLO Code	Course Learning Outcome	Aligned PLOs
CLO1	Describe the history, scope, and fundamental principles of microbiology, including the origin and characteristics of life and significance of microbes	PLO-1, PLO-2
CLO2	Classify microorganisms and explain their structural and functional diversity using modern taxonomic frameworks	PLO-1, PLO-5, PLO-10
CLO3	Analyze the structure, reproduction, and roles of viruses, viroids, prions, archaea, bacteria, and actinomycetes in natural and applied settings	PLO-2, PLO-3, PLO-6
CLO4	Investigate microbial growth, nutrition, environmental factors affecting microbes, and their biotechnological applications in agriculture, industry, and health sectors	PLO-3, PLO-5, PLO-7
CLO5	Explain the interactions of microbes with plants and humans, including symbiotic relationships and microbial pathogenesis in major diseases	PLO-6, PLO-8
CLO6	Discuss applications of microbiology in food, fermentation, probiotics, and waste management, demonstrating awareness of sustainability and environmental impacts	PLO-7, PLO-11, PLO-12

Mapping of CLOs with PLOs:

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
CLO1	√	√										
CLO2	√				√					√		
CLO3		√	√			√				√		
CLO4			√		√		√				√	√
CLO5						√		√				
CLO6							√				√	√

Course Contents

Topic	Teaching Learning Strategy	CLOs
1. Introduction: A brief historical background and scope of Microbiology.	Lecture	CLO1
2. Living organisms: Introduction to Living Organisms, Characteristics of Living Organisms, Origin of Life, spontaneous generation, biogenesis and germ theory of infectious diseases, Applications and Significance.	Lecture, group discussions,	CLO1
3. Position of microorganisms in the Living world: Introduction to Microorganisms, Diversity of Microorganisms, Classification and Taxonomy, Five-kingdom concept, three domain concept, prokaryotic versus eukaryotic cells, Role of Microorganisms in the Biosphere.	Lecture, Assignment	CLO2
4. Prions, Viroids, Rickettsia and Mycoplasma: Discovery, Structure, general characteristics and importance, Comparative Features and Significance.	Lecture, Group Discussion, and Assignment	CLO2
5. Viruses: Introduction to Viruses, Discovery, nature, structure of RNA virus (TMV) and DNA virus (T2 phage), multiplication of viruses, transmission of plant viruses, importance of viruses, virus diseases of important plants, Applications of viruses in biotechnology and gene therapy	Lecture, Group Discussion, and practical	CLO3
6. Archaea: Structure, Diversity, General characteristics, Structure and Morphology, Types and Ecological Groups of Archaea and importance, Ecological and Environmental Roles, Industrial and Biotechnological Applications	Lecture, Group Discussion,	CLO3
7. Bacteria: Prokaryotic nature, size, shape and arrangement of bacterial cell; chemical composition of flagella, pili, capsule, cell wall, cell membrane, nucleoid, cytoplasm, endospore; classification of bacteria on the basis of flagella, multiplication of bacteria (binary fission), importance of bacteria	Lecture, Group Discussion, and practical	CLO3

8. Actinomycetes: Introduction to Actinomycetes, general characteristics, Morphology and Physiology, Diversity, and Role and Importance of Actinomycetes, Biotechnological Applications	Lecture, Group Discussion and Assignment	CLO4
9. Growth and nutrition of microorganisms: Introduction to Microbial Growth, Generation time, Measurement of Microbial Growth, phases of growth curve, essential elements of microbial growth, Nutritional Types of Microorganisms, Culture Media, Environmental Factors Affecting Growth	Lecture, Group discussions and Assignment	CLO5
10. Microbial association: Introduction to Microbial Associations, Types of Microbial Associations, positive and negative interaction, commensalism, synargism, antagonism and symbiosis, Microbial Associations with Plants (Nitrogen fixation by bacteria in root nodules, Mycorrhizal associations with fungi, Endophytes and their roles)	Lecture, and Assignment	CLO5
11. Bacterial and viral diseases: Major human bacterial and viral diseases e.g. typhoid, SARS-Covid, Dengue, Zika, dysenteries, tetanus, tuberculosis, pneumonia, AIDS and polio	Lectures, Assignments	CLO6
12. Food and industrials microbiology: Introduction and scope of Food Microbiology, Pasteurization of milk, Microbial spoilage, Single cell protein, Fermented foods, Probiotics foods, Treatment and disposal of waste water, biogas production	Lectures, Assignments	CLO7

List of Books

Dubey, R. C., & Maheshwari, D. K. (1999). *A textbook of microbiology*. S. Chand and Co. Ltd.

Frobisher, M., Hinsdill, R. D., Crabtree, K. T., & Goodheart, C. R. (1974). *Fundamentals of microbiology* (9th ed.). W. B. Saunders Co.

Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2021). *Brock biology of microorganisms* (16th ed.). Pearson.

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

Prescott, L. M., Harley, J. P., & Klein, D. A. (2005). *Microbiology* (6th ed.). McGraw-Hill.

Tortora, G. J., Funke, B. R., & Case, C. L. (1997). *Microbiology* (6th ed.). Addison-Wesley Longman, Inc.

ইসলাম, এম., রফিকল, এম., মিহির, ল., এস., বাসার, এম. এ. (২০১১). *অণুজীব বিজ্ঞান.* হাসান বুক হাউজ.

ডুবেই, আর. সি., এবং মহেশ্বরী, ডি. কে. (১৯৯৯). *মাইক্রোবায়োলজি.* এস. চাঁদ অ্যান্ড কো. লিমিটেড।

Paper Code	213003	Marks: 100	Credits: 4	Class Hours: 60
Paper Title:	Mycology			

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of fungi, including their taxonomy, morphology, physiology, ecology, and economic importance. It aims to explore the diversity of fungal species and their roles in natural and human-influenced environments. Students will study the life cycles, reproductive strategies, and structural features of major fungal groups, as well as their interactions with plants, animals, and other microorganisms. The course also focuses on the medical, agricultural, and industrial significance of fungi, highlighting their roles as pathogens, decomposers, and producers of valuable bioactive compounds. Through both theoretical and practical approaches, students will develop skills in the identification, isolation, and cultivation of fungi, preparing them for advanced studies and careers in microbiology, plant pathology, biotechnology, and related fields.

Course Learning Outcome (CLOs):

CLO1:	Students will demonstrate a thorough understanding of the classification systems and identification techniques used to categorize fungi within the mycological kingdom.
CLO2:	They will be able to apply theoretical knowledge and practical skills to accurately identify major fungal groups based on their morphological, anatomical, and reproductive characteristics.
CLO3:	Additionally, students will gain insight into the diverse applications of fungi, including their ecological roles, industrial uses, and significance in medicine, agriculture, and biotechnology.
CLO4:	This comprehensive understanding will equip students to appreciate both the scientific and practical importance of fungi.
CLO5:	Furthermore, they will be able to evaluate the environmental and economic advantages of using fungal biofertilizers as eco-friendly alternatives to chemical fertilizers.

Mapping of CLOs with PLOs

CLOs	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
CLO1	√	√										
CLO2	√	√	√		√					√		
CLO3	√		√			√	√					
CLO4	√											
CLO5			√				√					

Course Contents

Topic	Teaching Learning Strategy	CLOs
1. **Introduction to Mycology**: Definition, history, scope, importance, fungal morphology and structure	Lecture, Discussion	CLO1, CLO4
2. **Myxomycetes (Slime Molds):** Habit, habitat, structure, reproduction, importance, applications	Lecture, Group Discussion	CLO1, CLO4
3. **Fungi:** General characteristics, cell wall chemistry, morphology, growth, nutrition, ecology, economy	Lecture, Group Discussion, Assignment	CLO1, CLO2, CLO4
4. **Classification of Fungi:** Taxonomy frameworks, major fungal groups, molecular taxonomy tools (PCR)	Lecture, Demonstration	CLO1, CLO2
5. **Fungal Classes:** Chytridiomycetes (*Olpidium, Synchytrium*)	Lecture, Slide Show, Assignment	CLO1, CLO2
6. **Fungal Classes:** Oomycetes (*Saprolegnia*, *Phytophthora*, *Albugo*)	Lecture, Group Discussion	CLO1, CLO2
7. **Fungal Classes:** Zygomycetes (*Absidia*, *Rhizopus*, *Choanephora*)	Lecture, Assignment	CLO1, CLO2
8. General characteristics of the following fungal classes and study of the somatic and reproductive features of the genera mentioned against each class: **Fungal Classes:** Ascomycetes (*Ascobolus*, Saccharomyces, *Aspergillus*, *Penicillium*, *Erysiphe*, **Claviceps**, *Neurospora*), Basidiomycetes (*Puccinia, Ustilago, Agaricus, Polyporus*), Deuteromycetes(*Candida, Alternaria, Cercospora, Fusarium, Macrophomina, Colletotrichum. Trichoderma*)	Lecture, Group Discussion, Assignment	CLO1, CLO2
9. **Role of Fungi:** Fungi as Decomposers (Saprophytic fungi and their ecological impact) a) Fungi in Symbiotic Relationships (mycorrhizae as plant symbionts, Fungal endophytes and plant health) b) Fungi as Pathogens (plant parasites) c) Fungi in Medicine (Production of antibiotics) d) Fungi in Agriculture (poisonous and edible mushrooms, Biological control agents, Biofertilizers) e) Fungi in Industry and Biotechnology (bread and brewer industry and producers of important metabolites) f) Harmful Effects of Fungi (food spoilage, mycotoxins)	Lecture, Case Studies, Discussion	CLO3, CLO4, CLO5

10. **Lichens:** Habitat, morphology, reproduction, classification, importance	Lecture, Group Discussion	CLO1, CLO4
11. **Laboratory Techniques:** Fungal culture, identification	Practical Lab Sessions	CLO2, CLO3

List of Books

Ainsworth, G. C. (1996). *A general purpose classification of fungi*. In *Bibliography of systematic mycology* (pp. 1–4). Commonwealth Mycological Institute.

Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). *Introductory mycology* (4th ed.). Wiley Eastern Ltd.

Hawker, L. E. (1967). *Fungi*. Hutchinson University Library, Cambridge University Press.

Kendrick, B. (2000). *The fifth kingdom* (3rd ed.). Focus Publishing.

Mehrotra, R. S., & Aneja, K. R. (1990). *An introduction to mycology* (2nd ed.). New Age International Publishers.

Moore-Landecker, E. (1982). *Fundamentals of the fungi*. Prentice-Hall, Inc.

Webster, J. (1980). *Introduction to fungi*. Cambridge University Press.

Course Code	213005	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Phycology			

Course Objectives

The objective of this course is to provide students with a comprehensive understanding of phycology the study of algae by exploring their classification, morphology, physiology, ecology, and economic importance. The course aims to familiarize students with the diversity of algal groups, including cyanobacteria, green algae, brown algae, red algae, and diatoms, and their evolutionary relationships. Emphasis is placed on the structural and reproductive features of major algal divisions, their ecological roles in aquatic and terrestrial ecosystems, and their contribution to global oxygen production and nutrient cycling. Additionally, the course highlights the industrial and commercial applications of algae, such as their use in biofuel production, pharmaceuticals, food, and wastewater treatment. Through theoretical and practical approaches, students will develop the skills necessary to identify algal species and understand their significance in both natural and applied contexts.

Course Learning Outcomes (CLOs)

Students Will Be Able To Learn Students Will Be Able To:

CLO1:	Describe the classification, morphology, and life cycles of major algal groups
CLO2:	Explain the ecological roles and evolutionary significance of algae in aquatic and terrestrial ecosystems
CLO3:	Identify common algal species using morphological and microscopic techniques
CLO4:	Understand the economic importance and industrial applications of algae, including bio-fertilizers, biofuels, and pharmaceuticals
CLO5:	Perform basic laboratory techniques such as algal sample collection, culturing, slide preparation, and microscopic observation
CLO6:	Analyze the role of algae in environmental processes like nutrient cycling and wastewater treatment
CLO7 :	Apply field and laboratory techniques for collection, identification, and preservation of algal samples

Mapping of CLOs with PLOs

CLOs \ PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	✔	✔		✔								✔
CLO2	✔	✔		✔		✔	✔	✔				✔
CLO3	✔	✔		✔	✔					✔		✔
CLO4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CLO5	✔	✔	✔	✔	✔				✔	✔	✔	✔
CLO6	✔	✔	✔	✔	✔	✔	✔			✔	✔	✔
CLO7	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔

Course Contents

Topic	**Teaching Learning Strategy**	**CLOs**
1. Introduction: Introduction to Phycology, Definition, history and scope of Phycology, General Characteristics of Algae, Ecology of Algae, Economic Importance of Algae	Lecture, Visual Aids, Discussion	CLO1, CLO2
2. Algal Habitat: Aquatic (fresh, brackish and marine water) terrestrial and sub-aerial	Lecture, Case studies, Group Discussion	CLO2
3. Classification of algae: Bases of classification (pigments, reserve foods, chloroplasts and flagella) classification up to Class according to F.E. Fritsch (1946) and R.R. Lee (1989), R.E Lee (2008). General characteristics of the different groups of algae	Lecture, Charts, Multimedia	CLO1
4. Pigment and Reserve Food: Pigments and reserve food materials in major divisions of Algae. **Plastid:** Types of chloroplasts of algae and their distribution.	Lecture, Diagrams, Concept mapping	CLO1
5. Morphology: Range of vegetative structure of algae	Visual aids, Group discussion	CLO1
6. Reproduction: Vegetative, asexual and sexual reproduction and perennation in algae	Lecture with illustrations, Comparison, charts	CLO1
7. Classification of Algae: General characteristics, classification up to order and reproduction of the following classes and the study of life history of the genera mentioned against each class: i. Cyanophyceae: Oscillatoria, Nostoc and Gloeotrichia	Visual aids, Microscopy, Group activity	CLO1, CLO3
ii. Chlorophyceae: *Chlamydomonas, Chlorella, Volvox , Oedogonium* and *Fritschiella*		
iii. Charophyceae: *Chara;*		

iv. Euglenophyceae: *Euglena;* v. Bacillariophyceae: *Navicul*a and *Chaetoceros;* vi. Phaeophyceae: Ectocarpus and Sargassum vi. Rhodophyceae: *Polysiphonia* and *Gelidium* vii. Cryptophyceae: *Cryptomonas* ix. Xanthophyceae: *Vaucheria.*		
8. Growth pattern and nutrition in algae.	Lecture, Group task, Research-based discussion	CLO2
9. Marine algae: Definition and scope, Historical development of marine phycology, Commercial Cultivation of Seaweeds (Traditional and recent methods). Mariculture of *Porphyra, Laminaria,Undaria, Gracilaria* etc.), Utilization of Seaweeds, species used as food and fodder, application to soil as a fertilizer or manure, medicinal uses, source for iodine, Marine algae in carbon sequestration and climate regulation, Industrial application of seaweeds, Environmental Significance	Case studies, Videos, Guest lecture (optional)	CLO4, CLO6
10. Origin and evolutionary trends in algae.	Comparative charting, Literature review	CLO2
11. Phytoplankton: Definition and general characteristics, floating mechanisms, classification, ecological and biological importance, general composition of fresh and marine water phytoplankton.	Lecture, Simulation tools	CLO2, CLO6
12. Importance: Ecological Importance of Algae, Economic Importance of Algae (Algae as food ; e.g., Spirulina, Chlorella, seaweeds), Industrial Applications of Algae (agar, alginate, carrageenan) Environmental Applications, Future Prospects and Innovations, Pharmaceutical and cosmetic applications, Algae in biofuel production and bioremediation	Case studies, Info graphic preparation	CLO4, CLO6
13. **Field and Laboratory Techniques:** Methods of sampling and preservation, Microscopy and staining	Field visit, Hands-on microscopy, Practical lab	CLO3, CLO5, CLO7

List of Books

Bold, H.C., & Wynne, M.J**.** (1978). *Introduction to the Algae*. Prentice Hall, India.

Chapman, V.J., & Chapman, D.J**.** (1973). *The Algae*. Macmillan, London.

Fritsch, F.E. **(**1946). *The Structure and Reproduction in Algae* (Vols. 1 & 2). Cambridge University Press.

Lee, R.R. (1989). *Phycology*. Cambridge University Press, UK.

Prescott, G.W. (1968). *The Algae: A Review*. Thomas Nelson, London.

Round, F.E. (1973). *The Biology of Algae*. St. Martin's Press, New York.

Round, F.E. **(**1981). *The Ecology of Algae*. Cambridge University Press, UK.

Smith, G.W. (1950). *The Freshwater Algae of the United States*. McGraw Hill Book Co. Inc., New York.

Van den Hoek, C., Mann, D.G., & Jahns, H.M. (1996). *Algae: An Introduction to Phycology*. Cambridge University Press.

রায়, শ., কু. প., নিশীথ ক. প., মোস্ফা ক., (১৯৯৫). *অপুষ্পক উদ্ভিদবিজ্ঞান* (১ম), বাংলা একাডেমী, ঢাকা।

Course Code	213606	Marks:100	Credits: 4	Class Hours: 60
Course Title	Lab-1: Microbiology, Mycology, Phycology and Viva-Voce			

Objectives This course provides an overview of microbial, mycological and phycological diversity by studying anatomical and distinguishing features. Students will also learn relevant laboratory skills such as specimen collection, preservation, identification and labeling.

Microbiology: 25 Marks

1. Handling and use of bright field compound microscope.
2. Microscopic observation of curd and nodule bacteria.
3. Staining and observation of bacteria by simple staining and Gram staining technique.
4. Observation of bacterial and actinomycetous colonies.
5. Demonstration of bacterial colonies by potato culture technique.
6. Study of viral plant disease symptoms e.g. tobacco mosaic and bean mosaic, Acalyphya mosaic etc.
7. Demonstration of microbial products e.g. Yoghurt, cheese and antibiotic.

Mycology: 25 Marks

1. Techniques for preparing temporary slides of fungal specimens for microscopic examination.
2. Preparation of lactophenol and cotton blue
3. Laboratory study of the following fungi:
   Synchytrium, Albugo, Rhizopus, Mucor, Saccharomyces, Aspergillus, Penicillium, Ascobolus, Puccinia, Agaricus, Fusarium, Alternaria, Collectotrichum, Cercospora, Polyporus
4. Study of lichen (crustose, foliose and fruticose)
5. Demonstration of fungal products e.g. bread, alcohol, citric acid and yeast grain.

Phycology: 25 Marks

1. Preparation of fixatives used in algal preservation
2. Collection and preservation of algae from various habitats.
3. Study of the genera covered in the theory with emphasis on both vegetative and reproductive structures.
4. Study of planktonic, benthic, terrestrial, sub-aerial, epiphytic, epizoic, marine and brackish water algae.
5. Local excursion.

Viva and Presentation: 25

Learning Outcomes	Upon completion of this course, students will able to: 1. Proficiency in microscope handling and slide preparation. 2. Competence in lab safety, sterilization, and aseptic techniques. 3. Skills in experimental design, data collection, analysis, and reporting. 4. Ability to interpret scientific results and present findings clearly. 5. Development of scientific drawing and documentation techniques.

	6. Identify anatomical and functional characteristics of virus, bacteria, algae and fungi representative and 7. Demonstrate proficiency in performing dissection and specimen mounting.

Instruction to the Examiners

Subject Code: Subject Title: Microbiology, Mycology & Phycology
Time: 6 hours Marks: 75

1. Specimen "A" will be a pure / potato culture of bacteria

Distribution of marks		Marks
(i) Preparation of slide	----------	2.0
(ii) Neat labelled diagrams	----------	1.0
(iii) Description	----------	2.0
(iv) Comments	----------	1.0
Total		6.0

2. Specimen "B" will be curd / nodule

Distribution of marks		Marks
(i) Preparation of slide	----------	2.0
(ii) Neat labelled diagrams	----------	1.0
(iii) Description	----------	2.0
(iv) Comments	----------	1.0
Total		6.0

3. Comment on C, D, E and F $1.0 \times 4 = 4.0$

C will be bacterial or actinomycetous colony or slide
D & E will be microbial products e.g. antibiotics, cheese, curd, root nodule
F will viral plant disease symptoms e.g. tobacco mosaic, bean mosaic, Acalypha mosaic etc.

Mycology

4. Specimen "G" and "H" Will be fungal specimens or fungal culture

Distribution of marks		Marks
(i) Preparation of slide	----------	1.5
(ii) Neat labelled diagrams	----------	1.5
(iii) Identifying characters	----------	2.0
(iv) Identify genus with class	----------	1.0
Total		$6.0 \times 2 = 12.0$

5. Specimen I, J, K and L will be samples of fungi and fungal products (bread, alcohol, citric acid and yeast grain).

Distribution of marks		Marks
(i) Identifying characters	----------	0.5
(ii) Identification	----------	0.5
Total		1 × 4 = 4.0

Phycology

6. Specimen "M" will be a mixture of algae of different classes (*Spirogyra* and *Hydrodictyon* must not be given and students must have to present three genera from three different classes)

Distribution of marks		Marks
(i) Preparation of slide	----------	1.0
(ii) Neat labelled diagrams	----------	2.0
(iii) Identifying characters	----------	2.0
(iv) Identify genus with class	----------	1.0
Total		6.0 × 3 = 18.0

7. Specimen N and O will be algal specimens or algal slides

Distribution of marks		Marks
(i) Identifying characters	----------	1.5
(ii) Identification	----------	1.0
Total		1.5 × 2 = 3.0

8. Excursion including submission of field note book, report and Collection (Mycology & Phycology) ---------- 10.0+5.0=15.0

9. Practical Note Book (Microbiology, Mycology & Phycology) ---------- 7.0

10. Viva -Voce and Presentation ---------- 25.0

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

Course Objective:
This course is designed to impart and enhance students' fundamental knowledge of key concepts in Physical, Organic, and Inorganic Chemistry. It aims to develop and expand their understanding of topics such As the states of matter, atomic structure, radiochemistry, chemical bonding, liquids and solutions, chemical equilibrium, pH, and both aliphatic and aromatic hydrocarbons.

Course Learning Outcomes (CLOs)
After completing this course, students will be able to:

	Upon completion of this course, the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	**CLO1**	explain the historical background, fundamental concept, and scope and aim of concepts of physical, Organic and inorganic chemistry.	A1, B1
	CLO2	clarify the state of matter, structure of atom, radiochemistry	A2
	CLO3	explain about the chemical bonding, Liquid and Solution	A1, B1, D2
	CLO4	explain the chemical equilibrium, pH, aliphatic and aromatic hydrocarbons	A1, A3, B1
	CLO5	explain the chemical equilibrium, pH, aliphatic and aromatic hydrocarbons, bonding, synthesis, nomenclature and properties.	A2, A3

Course Contents:

	Topics	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. Intermolecular 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	1, 2, 3
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 electron, Heisenberg uncertainty principle, Quantum numbers, atomic orbitals, Aufbau principle, Pauli	Lecture, Group Discussion, Assignment	3, 4, 5

	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	3, 4, 5
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	2, 3, 4
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	2, 3, 4
7	**Gaseous State:** Vapor 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 behavior, Van der Walls equation, critical constants. Dalton's law of partial pressure.	Lecture, Group Discussion, Assignment	1, 3
8	**Liquids and Solutions:** Liquids and their characteristics, evaporation, measurement vapor pressure, dependence of vapor 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	4, 5
9	**Chemical Equilibrium:** Equilibrium in chemical reactions. Stoichiometry, law of mass action, concentration versus time curves, equilibrium law and equilibrium constant: Kp, Kc, and Kx, 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	1, 6
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,	Lecture, Group Discussion, Assignment	1, 2

	acid-base strength, Salts: Classification and their applications, neutralization reactions.		
11	**Aliphatic hydrocarbons:** Organic compounds, homologous series, the causes of diversity of organic compounds, Hydrocarbons: classifications and IUPAC nomenclature. Formation of carbolations, 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	5, 6
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	5, 6

List of Books

Bahl, B. S., & Bahl, A. (2024). *Text- Book of Organic Chemistry*. S. Chand & Company Ltd Ram Nagar, New Delhi-1I005S

English, J., H.G Cassidy & Baird, R. I. (1949). *Principles of Organic Chemistry: An Introductory Text in Organic Chemistry*. MeGraw Hill.

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

Griffin, R. W. (2024). *Modern Organic Chemistry*. McGraw Hill.

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

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

Roberts, J. D., & Caserio, M. C. (1977). *Basic Principles of Organic Chemistry*. W. A. Benjamin, Inc., Menlo Park, CA.

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

Solomons, T. W. G. (2008). *Fundamental of Organic Chemistry*. Wiley

Course Code	212810	Marks: 50	Credits: 2	Class Hours: 30
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 standardization, titration and precipitation.

Course Learning Outcomes (CLOs)

After completing this course, students will be able to:

	Upon completion of this course, the students will be able to:		Mapping with PLOs
Course Learning Outcomes (CLOs)	**CLO1**	Discuss about the general laboratory safety policy, rules and regulations and chemical management process.	A1, B1, D1, D2
	CLO2	Explain the applications of apparatus and reagents in various experiments, different laboratory glassware and chemicals.	B1, D1, D2
	CLO3	Prepare stander solution and pH- neutralization curves	A4, B1, C3, D1, D2
	CLO4	Qualitative analysis of mixtures of inorganic salts consisting of up to five different radicals	A4, B1, C3, D1, D2

Course Contents:

	Topics	Teaching Learning Strategy	CLOs
1	**Safety:** Introduction of chemical, equipment's and safety in the laboratory.	Lecture, Group Discussion, Experimental, Assignment	1-5
2	**Preparation:** Preparation of $FeSO_4.7H_2O$ Mohr's salt and potash alum.	Lecture, Group Discussion, 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+} ,	Lecture, Group Discussion, Experimental, Assignment	1-5

	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^{-}.		
4	**Standardization:** Standardization of NaOH solution using standard oxalic acid solution.	Lecture, Group Discussion, Experimental, Assignment	1-5
5	**Determination:** Determination of Fe^{2+} using standard permanganate solution.	Lecture, Group Discussion, Experimental, Assignment	1-5
6	**Iodometric method:** Iodometric determination of copper (II) using standard Na_2SO_3 solution.	Lecture, Group Discussion, Experimental, Assignment	1-5
7	**Gravimetric Method:** Gravimetric determination of nickel as Ni $(HDMG)_2$ complex.	Lecture, Group Discussion, Experimental, Assignment	1-5
8	**pH-Neutralization Curves:** Determination of the pH-neutralization curves of a strong acid by a strong base.	Lecture, Group Discussion, Experimental, Assignment	1-5

List of Books:

Alexeyev, V. (2024). *Qualitative Analysis*. Mir Publishers.

Braun, D. R. (2024). *Introduction to Chemical Analysis*. McGraw Hill International,

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

Fifield, F. W., & Kealey, D. (2000). *Principles & practice of analytical chemistry*. Wiley.

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

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.

Wulfsberg, G. (1987). *Principles of Descriptive Inorganic Chemistry*. University Science Books, Mill Valley.

Course Code	213107	Marks: 100	Credits: 4	Class Hours: 60
Title	Zoology –I			

Course Objectives:

This course is an introduction to basic concepts in biology through study of the major lineages of invertebrate with emphasis on the ontogeny, structure, and function of organ systems. The students will be able to understand the living organisms with a focus on the animal kingdom and their direct impact on our economy.

Course Learning Outcome (CLO): After going through the course, students will be able to learn the following outcomes:

CLO1	**Fundamental Knowledge:** Explain the scope, levels of biological organization, and foundational zoological concepts with emphasis on animal diversity and phylogeny.
CLO2	**Biodiversity & Taxonomy:** Identify and classify major animal phyla and economically significant species using morphological, ecological, and systematic criteria, with focus on Bangladesh's fauna.
CLO3	**Practical Research Skills:** Apply field and laboratory techniques to study animal anatomy, life cycles, and biodiversity, including calculations of diversity indices for local ecosystems.
CLO4	**Applied Zoology:** Analyze the role of zoology in agriculture, fisheries, and public health, proposing context-specific solutions for Bangladesh.
CLO5	**Ethics & Communication:** Present scientific findings on animal systems through structured reports or presentations, adhering to ethical guidelines in wildlife research and conservation.

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
Group-A: General Zoology		
1. **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 based on organization, symmetry, coelom and phylogeny; different taxa, Linnean hierarchy and nomenclature.	Lecture, and Group Discussion,	CLO1
2. Biodiversity: Concept, types, components, importance and values, bioresources – threats and conservation importance, estimation and calculation process of biodiversity, faunal diversity in Bangladesh.	Lecture, Group Discussion, Assignments and tutorial sessions	CLO2 CLO3
3. Methods of Studying Animals: Survey of aquatic and terrestrial animals; Methods of animal collection, transportation, preservation, identification, description, tagging	Lecture, Group Discussion, and Assignments	CLO3 CLO5
4. **Systematics**: Identifying characteristics, life cycle, habitats, and economic importance of **a. Zooplankton:** Radiolarians, foraminiferans, and dinoflagellates, cnidarians, and crustaceans b. **Parasitic and vector insects:** Fleas, lice, mites, ticks, mosquitoes, and various flies c. **Aquatic Insects**: Trichoptera, Ephemeroptera, True bugs, Odonata, Plecoptera, Beetles, Caddisflies, Non-biting midges, Coleoptera, Diptera, Dragonflies and damselflies, Mayflies, Stoneflies	Lecture, Group Discussion, Lab demo and Field visit	CLO2
Group B: **Type Study**		
1. **Short study:** Diagnostic characteristics and economic importance of the following non-chordates with examples – Apicomplexa, Ciliophor, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Gastrotricha, Nematomorpha, Rotifera, *Trypanosoma, Leishmania*, *Amoeba, Monocystis, Nosema, Spongilla, Adamsia, Fasciola, Schistosoma, Convoluta, Diphyllobothrium, Ancylostoma, Enterobius, Wuchereria, Loa, Trichuris, Loligo, Octopus, Mytillus, Sepia, Tubifex, Limulus, Eupagurus*, *Squilla,* moths & butterflies, termite, bugs and bees	Lecture, Group Discussion, and Assignments	CLO2
2. **Descriptive study:** Systematic position, habitats, external morphology, organ systems such as digestion, movement, circulation, respiration, excretion, nervous, and reproduction and development; food and feeding habits– a. Phylum Sarcomastigophora: *Euglena*	Lecture, Group Discussion, and tutorial sessions	CLO1

b. Phylum Ciliophora: *Paramecium* c. Phylum Porifera: *Scypha* d. Phylum Cnidaria: *Obelia* e. Phylum Nematoda: *Ascaris* f. Phylum Platyhelminthes: *Taenia* g. Phylum Mollusca: *Pila* h. Phylum Arthropoda: *Prawn* i. Phylum Echinodermata: *Astropecten* j. Phylum *Hemichordata: Balanoglossus*.		
3. Applied Zoology: a. Introduction to the major fields of Applied Zoology: Entomology, Fisheries, Wildlife Biology, Parasitology and others. b. Agricultural Pests: Major Pests of Rice, Jute, Sugarcane & stored grain. c. Integrated Fish Farming: Types; Poultry, Livestock and Paddy-cum -Fish Culture. d. Poultry farming: g of poultry farming, diseases of poultry and their control, economic importance of poultry and their impacts on socio-economic condition of Bangladesh.	Lecture, Group Discussion, Assignments and Field visit	CLO4 CLO5

List of Books:

Campbell, N., & Reece, J. (2005). *Biology*, 7th edn. 2005, Pearson

Gaston, K. J., & Spicer, J. I. (2013). *Biodiversity: An Introduction (2nd ed)*. John Wiley and Sons Inc., New York.

Hickman, C.P., Keen, S. L., Eisenhour, D.J., Larson, A. and I'Anson, H. (2023). *Integrated Principles of Zoology*. 19th edition. 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): *Text Book of Zoology,* Vol. I, Macmillan

Ruppert, E. E., Fox, R. S., and Barnes, R. D. (2006). *Invertebrate Zoology* (8th ed.). Holt Saunders International edition

Singla, M., Kaur, A., Sitre, S. R., and Gupta, A. (2023). Applied Zoology and Animal Biotechnology. 1st edition. AG Publishing House, India.

উদ্দিন, মোঃ. না. (২০০৪). *স্নাতক প্রাণিবিজ্ঞান, (প্রোটোজোয়া এবং নন-কর্ডাটা),* নিসর্গ প্রকাশনী-বাংলা বাজার, ঢাকা

দত্ত, স্ব. কু. এবং অন্যান্য (২০০৪). *প্রাণিবৈচিত্র-প্রথম খন্ড-অমেরুদন্ডী প্রাণী,* মল্লিক ব্রাদার্স-বাংলা বাজার, ঢাকা।

হোসেন, আ. এবং অন্যান্য (২০০৩). *প্রাণিবিজ্ঞান পরিচিতি,* মল্লিক ব্রাদার্স, বাংলাবাজার, ঢাকা

Course Code	213108	Marks: 50	Credits: 2	Class Hours: 30
Course Title	Zoology Practical-I			

1. **Study of museum specimens:** Representative of all major non-chordate phyla (*Sycon, Spongilla, Spongia, Physalia, Metridium, Adamsia, Ascaris, Fasciola, Taenia, Nereis, Arenicola, Pheretima, Hirudo, Sipunculus, Lingula, prawn, Chiton, Pila, Unio, Nautilus, Sepia, Loligo, Octopus, Eupagurus, Limulus, millipedes, centipedes, Palaemon, Antedon, Asterias, Echinus, Holothuria)*

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. 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 the 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.
   Invertebrate specimens (4 items) 2×4 = 8 marks.
   Whole mount slides (mouth parts, parasites, larvae) (2 items) 2×2 = 4 marks.
   Histological slides (2 items) 2×2 = 4 marks.
4. Appendages (detachment, placement and drawing on a Course sheet 3, labeling 2, displaying 1) = 6 marks.
5. Class records =10 marks.

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

Course Objective:

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 (CLOs):

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

CLO 1: 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.

CLO 2: 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.

CLO 3: Apply their historical and cultural understanding to interpret contemporary national issues and debates relating to identity, political reform, and cultural transformation in Bangladesh.

CLO 4: 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:

Course contents	Teaching Learning Strategy	CLOs
1. Pre-colonial Era • 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)	Interactive lectures,	CLO 1,2

• 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	reading, and assignments	
3. Colonial Era (First Half of the 20th Century) • 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) • Language Movement • Political, Economic, and Cultural Aspects • Growth of Vernacular Nationalism • Cultural Activism	Interactive lectures and group discussion	CLO 2,3
5. Changing Bengali Identity • 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	Interactive lectures and thematic assignments	CLO 2,3
6. Liberation Movement of 1971 and Mass Uprising till 2024 • 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	Interactive lectures, group discussions, and thematic assignments	CLO 1 CLO 3-4

• 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		
7. History of Other Ethnic Groups • 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 • 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.

Habib, L. (1982). *Cambridge economic history of India. Cambridge.* Cambridge University Press.

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, 1. (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 19801

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)

Course Contents

Unit	Specific Objectives	Topics	Teaching and Learning Approach
Unit 1: Introduction to Information and Communications Technology (ICT) and Computer System	The student will be able to: • 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: • 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 • Distinguish between Open Source and Proprietary 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; Proprietary and Open Source Software	Classroom lectures and Lab
Unit 3: Introduction to Word Processing Application	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.	Word Processing Packages and Their Uses Creating a Document Using a Word Processor Saving a Document Using the 'Save As' command Editing a Word Document Using Common Editing Tools: Copy/cut, paste, Undo and redo, find, replace, clipboard Creating a Document with More Sub-Headings and Paragraphs Text correction, Wrapping options, Text orientation Formatting and saving a Word document using the formatting tools: font (style, size, color, etc.), bold, underline, italic, superscript, subscript,	Classroom Lectures, Lab, and Hands-on Practice

		shadow, strikeout, font color Paragraph Editing: alignment, bullet & numbering, indent, line spacing, table border Collaborative Editing: Using the highlighting option to track changes in a document, accepting or rejecting changes Insert: Adding text comments, Inserting Tables in a Word Document and inserting Symbols and Pictures in a Word Document. Header, footer, page number, drop cap, word art Page Design: watermark, page border Layout: Page setup/print	
Unit 4: Spreadsheet Application	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 Spreadsheet. • 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.	Spreadsheet Packages, e.g. Excel Importance of Spreadsheet application in Data Management, Related Concepts and Terminologies (e.g., cell(s), rows, columns, worksheet, workbook) Features in the Spreadsheet Window Tool Bars: formatting bar, standard bar, formulae bar Types of Data and Their Uses (e.g., number, date, text, currency), Creating and Saving a Workbook, Constructing and Inserting Simple Formulae and Functions Formatting Worksheet Using Formatting Tools	Classroom Lectures, Lab and Hands-on Practice

		Draw a Graph/chart Editing and Printing Worksheet	
Unit 5: Presentation Application	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.	Presentation Applications Packages, Devices used for Presenting, Importance of Presentation Application, Principles for Designing Presentations, Terminologies in Presentation Application (eg, Slide Layout, Slide transitions, Slide show, etc.), Identification of Commonly Used Features of Presentation Application Window: Toolbars, Different presentation view modes Prepare a Presentation: Adding elements and formatting slides, slide Show, slide transition, animation Effects Selection of Print Option: Entire presentation, Specific slides, Handouts, Notes pages, outline view of slides, and Number of copies	Classroom Lectures, Lab and Hands-on Practice
Unit 6: Privacy and Security	The student will be able to: • Understand the basics of digital security • Use some security tools. • Understanding digital ethics.	Introduction to Information Security, cybercrime, DoS and DDoS Attack, Key Management, Digital Signature and Certifications, privacy, Data Security, Vulnerability, Threat and Risk, Malware, Social Engineering, Hacking, Plagiarism, Fishing, Software Piracy, Worms and Viruses, Spam, Adware, Malware,	Classroom Lectures, Lab and Hands-on Practice

		Spyware, Antivirus Software Ethics in the digital world	
Unit 7: Using The Internet to Communicate and Accessing Information	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
Unit8: Emerging Technologies:	• Define Data Analytics, Artificial Intelligence	Introduction to Data Analytics: What is Data?	Classroom Lectures,

Data analytics, Artificial intelligence, Machine learning	(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.	Types of Data, Basic Steps in Data Analytics, Simple Tools; Artificial Intelligence (AI): Making Machines Capable of Performing Tasks that Require Human-Like Thinking. Common Examples: Voice Assistants, Facial Recognition, GPS Route Suggestions, Chatbots.; AI Capabilities: Understanding Language, Recognizing Patterns, Making Decisions; Machine Learning (ML): Define Machine Learning (ML), How It Works, Classification and Examples; Relationship Between Data Analytics, AI, and ML Benefits & Challenges of Data Analytics, AI, and ML. Future Trends & Career Paths	Lab and Hands-on Practice

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	Credits: 1	Class Hours: 15
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 e-mail
CLO 5	Installation of anti-virus software
CLO 6	Data collection, Prediction using AI, ML, Data Analytics

List of Experiments

CLO Addressed	Unit	Experiments	Teaching Learning Approach
CLO1	1-4	• Assemble different hardware • Install different software • Operate the computer - Drive, folder and file management • Maintenance	Lab and Hands-on Practice
CLO 2	3	**Word** • 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	• **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** • 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	Lab and Hands-on Practice
CLO4	6	• Install antivirus software, e.g., Norton Antivirus, McAfee, Kaspersky, Avast.	Lab and Hands-on Practice
CLO5	7	• Use of email • Access information from the internet, use a search engine. • Use of virtual drive for collaboration • Google Meet, Zoom	Lab and Hands-on Practice
CLO6	8	• Data Collection and Visualization • Simple Prediction Using Trendlines	Lab and Hands-on Practice

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.

Allied/Non-Major Course Syllabus

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 (CLOs):

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

CLO1	Describe the origin and evolution of life and differentiate between plant and animal characteristics.
CLO2	Explain the structure, reproduction, classification, and importance of viruses, bacteria, viroids, prions, rickettsia, and mycoplasma.
CLO3	Demonstrate understanding of the morphology, reproduction, classification, and ecological roles of fungi, cyanobacteria, and algae.
CLO4	Identify key features and importance of phytoplankton, lichens, and aquatic ecosystems.
CLO5	Classify and describe major plant groups: bryophytes, pteridophytes, gymnosperms, and angiosperms, including their life cycles and economic roles.
CLO6	Recognize economically important plant families and their characteristics using plant classification systems.
CLO7	Explain the causes, symptoms, and control measures of common plant diseases and understand the principles of plant pathology
CLO8	Identify and describe the uses of economically important plants for food, medicine, timber, fiber, oil, and vegetables, including processing methods for tea and rubber.

Course Contents

Topics	Teaching-Learning Strategies	Course Learning Outcomes (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 *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.	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, symtomatology and control measures; forecasting of plant diseases. Causal	Case studies, Lecture, Sample study	CLO7

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.		
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.	Case studies, Lecture, Sample study	CLO7

Course Code	213008	Marks:50		
Course Title:	Botany -I Practical			

Course Objectives: The practical component of this course aims to provide students with foundational skills in identifying and observing major plant groups and microorganisms. Students 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 such as slide preparation, microscopic analysis, and scientific drawing will also be practiced.

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

Cyanobacteria :	*Nostoc, anabaena*
Algae:	*Saccnaromyces and Accoboius*
Bryophyte:	*Riccia and Marchantia*
Pteridophyte:	*Selaginella, Christella*
Gymnosperms:	*Cycas*
Angiosperm:	Poaceae and Fabaceae

2. Identification of the following genera with reasons: 06

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
4. Study of the symptoms and causal organisms of Brown spot of rice and stem rot of Jute. 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

List of Books

Agrios, G. N. (1997). *Plant pathology* (4th ed.). Academic Press.

Alam, A. R., & Mojumder, Z. (n.d.). *Moulika botany* (Vols. 1, 2, & 3).

Bold, H. C., & Wynne, M. J. (1978). *Introduction to the algae*. Prentice Hall of India.

Hawker, L. E. (1967). *Fungi*. Cambridge University Press.

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

Lawrence, G. H. M. (1951). *Taxonomy of vascular plants*. The Macmillan Company.

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

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

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

ইসলাম, এম. আর., সাহা, এম. এল., এবং বাসার, এম. এ. (২০০৪). *অণুজীব বিজ্ঞান*, হাসান বুক হাউজ, ঢাকা

রায়, এস. কে., পাল, এন. কে., এবং পাশা, এম. কে. (১৯৯৫). *অপুষ্পক উদ্ভিদবিজ্ঞান* (১ম), বাংলা একাডেমী, ঢাকা