NATIONAL UNIVERSITY

BANGLADESH

First Year Syllabus

Department of Soil Science

Four-Year B. Sc. (Honors) 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 Soil Science

Programme Educational Objectives (PEOs)

PEO 1: Core Scientific Competency

To develop a strong foundation in the fundamental principles of soil science, including soil genesis, classification, soil physics, soil chemistry, soil fertility, soil microbiology, and environmental interactions, to understand soil as a natural resource critical for sustainable agriculture and ecosystem.

PEO 2: Application in Agriculture and Environment

To apply soil science knowledge in solving real-world problems related to sustainable agriculture, land use, environmental management, and natural resource conservation in Bangladesh and beyond.

PEO 3: Research and Higher Studies

To pursue advanced education, research, and innovation in soil science and allied disciplines such as agronomy, crops of Bangladesh, environmental science, geology, and climate change adaptation.

PEO 4: Ethical and Social Contribution

To demonstrate ethical responsibility and commitment to serving society by promoting sustainable use of soil resources, environmental awareness, and contributing to national development goals such as food security and climate resilience.

PEO 5: Lifelong Learning and Professional Development

To engage in lifelong learning and professional development, and effective communication to remain competent in the face of evolving scientific and technological advancements related to soil and environmental sciences.

Programme Learning Outcomes (PLOs)

All the time of graduation B.Sc. (Honours) in Soil Science students will have achieved the ability to:

PLO 1: Knowledge of Soil Science

Demonstrate comprehensive knowledge of soil formation, classification, chemistry, fertility, biology, physics, and environmental interactions related to soil systems.

PLO 2: Application of Knowledge

Apply scientific principles of soil science to solve problems related to agriculture, environmental protection, land management, and natural resource sustainability.

PLO 3: Laboratory and Field Skills

Develop technical proficiency in laboratory techniques, field sampling, soil testing, and the use of instruments and software relevant to soil analysis.

PLO 4: Research and Inquiry

Design, conduct, and interpret scientific research in soil science and present findings using appropriate methodologies and ethical practices.

PLO 5: Communication Skills

Communicate scientific ideas, research outcomes, and technical information effectively in oral, written, and graphical formats to diverse audiences.

PLO 6: Problem Solving and Critical Thinking

Analyze complex problems related to soil and environmental issues using critical thinking, data analysis, and evidence-based approaches.

PLO 7: Environmental and Social Responsibility

Demonstrate understanding of environmental stewardship, sustainable land use practices, and the social responsibilities of soil scientists in national development.

PLO 8: Ethics and Professionalism

Practice academic integrity, scientific ethics, and professional responsibility in all aspects of work, including research, reporting, and collaboration.

PLO 9: Teamwork and Leadership

Work effectively as a team member or leader in multidisciplinary groups to address soil-related and agricultural challenges.

PLO 10: Lifelong Learning

Engage in lifelong learning and continuous professional development to adapt to evolving technologies, scientific advancements, and changing societal needs.

Mapping PEO with PLO:

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

Year wise Courses and marks distribution

FIRST YEAR

Course Code	Course Title	Marks	Credits
213301	Introductory Soils-I	100	4
213303	Introductory Soils-II	100	4

213207	Introduction to Geography and Environment	100	4
213304	Soil Science Practical	100	4
212807	Chemistry-I	100	4
2128010	Chemistry-I Practical	50	2
213007	Botany-I	100	4
213008	Botany-I Practical	50	2
219901	History of Bangladesh: Language, Culture and Identity	100	4
219903	Information Communication and Technology	75	3
219904	Lab: Information Communication and Technology	25	1
	Total=	**900**	**36**

Detailed Syllabus

Course Code	**213301**	**Marks: 100**	**Credits: 4**	**Class Hours: 60**
Course Title:	**Introductory soils-I**			

Course Objectives:

By the end of the course, students will be able to:

1. **Understand the foundation and evolution of Soil Science**

   Explain Soil Science as an independent discipline, its historical development, and its relationship with other scientific fields.

2. **Comprehend the nature and concept of soil as a natural body**

   Analyze the concept of soil in relation to the Earth's structure, biotic and abiotic components, and its role in environmental segments and ecosystems.

3.Identify and describe soil composition

   Understand the solid, liquid, and gaseous phases of soil, including the chemical composition of soil solids.

3. **Recognize the geological basis of soil formation**

Identify types of soil-forming rocks and minerals, their classification, genesis, properties, and their roles in pedogenesis.

4. **Explore the fundamental processes of soil formation**

   Examine the processes of weathering, silicate structures, and the synthesis of silicate clays, and assess the factors influencing soil formation.

5. **Understand soil profile development and horizons**

   Describe soil horizons (Master horizons), the formation of soil profiles, and identify characteristics of an ideal soil profile.

6. **Analyze the physical nature of soil as a three-phase system**

   Understand mass-volume relationships of soil components and their relevance in soil behavior and management.

7. **Examine soil texture and structure**

   Classify soil texture and structure, conduct practical size analysis, and explain their genesis and agricultural significance.

8. **Evaluate basic soil physical properties**

   Measure and interpret soil bulk density, particle density, porosity, and soil temperature in relation to plant growth and soil management.

Course Learning Outcome (CLO):

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

CLO 1: Describe the nature and historical development of Soil Science as an independent discipline.

CLO 2: Explain the concept of soil as a natural body and its role within the Earth's biotic and abiotic environments.

CLO 3: Analyze the role of soil as a component of the ecosystem and its environmental functions.

CLO 4: Identify and interpret the physical composition of soil including solid, liquid, and gaseous phases.

CLO 5: Explain the chemical composition of soil solids and their implications in soil behavior.

CLO 6: Classify soil-forming rocks and minerals and evaluate their genesis, properties, and significance in soil formation.

CLO 7: Explain the fundamental processes and mechanisms of soil formation, including weathering and synthesis of silicate clays.

CLO 8: Analyze the factors affecting soil formation and the development of soil horizons and profiles.

CLO 9: Describe the physical organization of soil as a dispersed three-phase system and explain its mass and volume relationships.

CLO 10: Classify soil texture and structure, and explain their genesis, classification, and importance in soil behavior., genesis, and importance

CLO 11: Measure and interpret soil physical properties including density and temperature, and explain their significance in soil functioning.

Course Contents:

Topics / Subtopics	Teaching–Learning Strategy (TLS)	CLOs
- Definition of Soil Science - Historical development as a discipline - Branches and scope	- Lecture - Group discussion - Timeline chart presentation	**CLO 1**
- Soil as a natural body - Soil vs. Earth crust - Biotic & abiotic environments	- Lecture - Case examples - Diagram-based explanation	**CLO 2**
- Soil in the ecosystem - Functions of soil (ecological, biological, hydrological, etc.)	- Problem-based learning - Concept mapping - Group work	**CLO 3**
- Soil composition (solid, liquid, gas) - Soil as a three-phase system	- Lecture with diagrams - Hands-on modeling (clay–water–air)	**CLO 4**
- Chemical composition: minerals, organic matter - Importance in soil behavior (CEC, pH, etc.)	- Lecture - Visual aids (charts, models) - Video demo	**CLO 5**
- Rocks & minerals: classification, properties - Weathering of rocks	- Hands-on rock/mineral samples - Guided lab activity	**CLO 6**
- Soil formation processes - Weathering types - Formation of silicate clays	- Lecture - Animation/video demo - Group work	**CLO 7**

- Soil forming factors (CLORPT) - Soil horizon & profile development	- Case study analysis - Field observation (virtual/real)	**CLO 8**
- Soil as dispersed system - Mass-volume relationships (bulk & particle density)	- Mathematical demonstration - Problem-solving session	**CLO 9**
- Soil texture classes - Soil structure types - Importance in soil functioning	- Hands-on lab demo (texture by feel & sedimentation) - Group lab activity	**CLO 10**
- Soil density (bulk & particle) - Soil temperature & its influence	- Field or lab demonstration - Real-time data recording	**CLO 11**

List of Books:

Bridges, E.M., 1997. *World soils*. 3rd ed. Cambridge: Cambridge University Press.

Buol, S.W., Southard, R.J., Graham, R.C. and McDaniel, P.A., 2005. *Soil genesis and classification*. Ames: Iowa State Press.Das,

D.K., 2019. *Introductory soil science*. 5th ed. New Delhi: Kalyani Publishers.

Jenny, H., 1980. *The soil resource: origin and behavior*. New York: Springer-Verlag.

Khan, M.K.A.U. (n.d.). *প্রফেসর লোয়ার হোসেন হাওলাার ও প্রফেসর মো: হুমায়ূন কবির. আধুনিক মৃত্তিকাবিজ্ঞান.*

Sehgal, J., 2005. *Pedology: concepts and applications*. New Delhi: Kalyani Publishers.

Weil, R.R. and Brady, N.C., 2015. *The nature and properties of soils*. 15th ed. Boston: Pearson.

Course Code	**213303**	**Marks: 100**	**Credits: 4**	**Class Hours: 60**
Course Title:	**Introductory soils-II**			

Course objectives:

By the end of the course, students will be able to:

1. **Understand the diversity and classification of soil biota**
   - To introduce the types and roles of soil microorganisms (bacteria, actinomycetes, fungi, algae) and soil fauna (oligochaetes, nematodes, arthropods, mollusks, protozoa, slime moulds, and viruses) in the soil ecosystem.
2. **Explain plant-root interactions with soil biota**
   - To analyze how plant roots interact with various soil organisms and contribute to nutrient cycling and soil health.

3. **Describe the structural and functional roles of key microbial groups in the soil**
    - To explore the occurrence, population dynamics, structure, and ecological functions of major microbial groups in the rhizosphere and soil matrix.
4. **Classify soil microflora based on nutritional behavior**
    - To provide an understanding of the nutritional requirements and modes of nutrition (autotrophs, heterotrophs) of soil microorganisms.
5. **Explain how soil serves as a source of energy and nutrients to biota**
    - To understand how soil minerals, organic matter, and biomass serve as nutrient and energy sources, and the role of the soil atmosphere in supporting microbial life.
6. **Understand the concept of soil pH and soil solution**
    - To explain the importance of soil pH in nutrient availability and the nature and composition of soil solutions as a medium for nutrient transport.
7. **Identify essential plant nutrients and recognize their deficiency symptoms**
    - To learn the criteria of essentiality, classification of nutrients, their functions in plant metabolism, and visual symptoms of nutrient deficiencies—especially of N, P, K, and S.
8. **Differentiate between soil fertility and productivity**
    - To distinguish these two fundamental concepts and understand their implications in soil and crop management.
9. **Gain an overview of the fertility status of soils in Bangladesh**
    - To familiarize students with region-specific soil fertility constraints and potentials in Bangladesh.
10. **Understand the principles and practices of soil fertility management**
    - To introduce the need for soil fertility improvement and provide basic knowledge about sustainable soil fertility management techniques.

Course Learning Outcomes (CLO):

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

CLO No.	Course Learning Outcome
CLO 1	Identify and classify different types of soil biota, including microflora, meso-fauna, and macro-fauna.
CLO 2	Describe the structure, population dynamics, and ecological functions of soil microorganisms such as bacteria, actinomycetes, fungi, and algae.
CLO 3	Explain the interactions between plant roots and soil biota and their importance in nutrient cycling and soil health.
CLO 4	Classify soil microflora based on their nutritional groups and explain their roles in soil ecosystems.
CLO 5	Analyze the role of meso- and macro-fauna (e.g., nematodes, oligochaetes, arthropods, mollusks, protozoa, viruses, slime moulds) in soil processes.
CLO 6	Evaluate the significance of soil as a source of energy and nutrients to soil biota, including contributions from minerals, organic matter, and soil atmosphere.
CLO 7	Explain the concept of pH and soil solutions and their importance in soil chemistry and

	plant growth.
CLO 8	Identify essential plant nutrient elements, describe their classification, and list criteria for essentiality
CLO 9	Describe the basic functions of essential nutrient elements and recognize deficiency symptoms in plants
CLO 10	Explain the roles of Nitrogen (N), Phosphorus (P), Potassium (K), and Sulfur (S) in plant nutrition and growth.
CLO 11	Define soil fertility and soil productivity, and distinguish between these two concepts
CLO 12	Summarize the fertility status of soils in Bangladesh with relevant examples
CLO 13	Explain the need for soil fertility management in sustainable agriculture.
CLO 14	Describe basic soil fertility management techniques and their significance in maintaining soil productivity.

Course Contents:

Topic / Sub-topic	TLS (Teaching-Learning Strategies)	CLOs
Types of soil biota: microflora, meso-fauna, macro-fauna	Lectures, Group Discussions, Visual Aids	CLO 1
Structure and function of soil microorganisms	Lectures, Visual Aids, Microscopic Observation	CLO 2
Root-microbe interactions	Lectures, Case Studies, Group Discussions	CLO 3
Microflora classification	Lectures, Diagrams, Interactive Sessions	CLO 4
Meso- and macro-fauna roles	Lectures, Visual Aids, Case Studies	CLO 5
Soil as a habitat and nutrient source	Interactive Lectures, Demonstration, Field Observation	CLO 6
Soil pH and solution	Demonstration, Lab Experiments	CLO 7
Essential nutrients: classification, functions, and deficiency	Lectures, Nutrient Deficiency Charts, Group Discussions	CLO 8, 9
Role of Nitrogen (N), Phosphorus (P), Potassium (K), Sulfur (S)	Lectures, Case Studies, Diagrams	CLO 10
Soil fertility vs. productivity	Lectures, Group Discussions	CLO 11
Bangladesh soil fertility status	Lectures, Field Visits, Real Data Analysis	CLO 12
Need for soil fertility management	Lectures, Sustainability Case Studies	CLO 13
Soil fertility management techniques	Lectures, Group Projects	CLO 14
Significance of fertility management in productivity	Lectures, Group Projects, Field Visits	CLO 14

List of Books:

Green, D. E., Stout, V. M., & Taylor, D. J. (1995). *Biological science* (2nd ed.). Cambridge University Press

Khan, M. K. A. U. (n.d.). *প্রফেসর লোয়ার হোসেন হাওলাার ও প্রফেসর মো: হুমায়ূন কবির*. আধুনিক মৃত্তিকাবিজ্ঞান.

Killham, K. (1994). *Soil ecology* (1st ed.). Cambridge University Press.

Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (1988). *Microbiology* (5th ed.). McGraw-Hill Book Company

Weil, R. R., & Brady, N. C. (2015). *The nature and properties of soils* (15th ed.). Pearson

Course Code	213207	Marks: 100	Credits: 4	Class Hours: 60
Course Title:	Introduction to Geography and Environment			

Course Objectives:

By the end of the course, students will be able to:

1. **Explain the Basic Concepts and Scope of Environmental Science**
    - Understand the concept, importance, and scope of environmental science.
    - Describe environmental science as an interdisciplinary field and identify its major components, types, and influencing factors.
    - Analyze the relationship between the environment and living systems.
2. **Identify and Analyze Key Environmental Problems**
    - Recognize global and local environmental problems and their impacts on ecosystems and human life.
    - Understand the functions and components of the environment in maintaining ecological balance.
3. **Assess the Impact of Human Population on the Environment**
    - Explain population change, population pyramids, and the concept of carrying capacity.
    - Discuss the global trends in human population growth and the consequences of overpopulation.
    - Evaluate sustainability challenges and the Gaia hypothesis in relation to population pressure.
4. **Evaluate Lithospheric Resources and Sustainable Land Use**
    - Examine the relationship between agriculture and the environment.
    - Analyze soil fertility, erosion, and pollution, and propose methods for sustainable soil management.
    - Understand the impact of urbanization and the importance of sustainable waste management.
5. **Understand Atmospheric Composition and Pollution Issues**

- Describe the evolution, composition, and structure of the atmosphere.
- Explain the sources and effects of air pollution, global warming, and climate change.

6. **Analyze Water Resources and the Hydrosphere**
   - Identify the sources of water pollution and assess their impact on water quality.
   - Understand basic methods of water treatment and principles of sustainable water use.
7. **Explore the Role of Microorganisms in the Biosphere**
   - Describe the types and functions of microbial populations in the environment.
   - Understand microbial contamination and its effects on environmental and public health.
8. **Evaluate the Environmental Impact of Heavy Metals**
   - Identify the sources and properties of heavy metals in the environment.
   - Explain their toxicological effects on ecosystems and human health.
   - Propose methods for reducing and managing heavy metal contamination.

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

CLOs	Course Learning Outcomes (CLOs)
CLO 1	Describe the fundamental concepts, importance, and scope of environmental science.
CLO 2	Explain the interdisciplinary nature and major fields of environmental science.
CLO 3	Identify and analyze key environmental problems and their causes.
CLO 4	Illustrate the relationship between living systems and the environment.
CLO 5	Discuss the functions, components, types, and influencing factors of the environment.
CLO 6	Analyze human population growth, its environmental impact, and suggest sustainable solutions.
CLO 7	Interpret population pyramids and apply the concepts of carrying capacity and Gaia hypothesis.
CLO 8	Evaluate the impact of agriculture on the environment and suggest sustainable practices.
CLO 9	Discuss soil-related environmental issues such as erosion, pollution, fertility loss, and solutions.
CLO 10	Explain the environmental impacts of urbanization and outline effective waste management strategies.
CLO 11	Describe the evolution, composition, and structure of the atmosphere, and explain the causes and effects of air pollution, global warming, and climate change.
CLO 12	Identify major sources of water pollution and explain its impact on water quality, and outline basic treatment methods.
CLO 13	Discuss microbial activities and population in the biosphere, and explain the causes and consequences of microbial contamination.
CLO 14	Explain the sources and properties of heavy metals and assess their toxicological effects on the environment and living organisms.

Course Content:

Course Topics	Teaching–Learning Strategy	CLOs

	(TLS)	
Basic concepts of environmental science: Concept, importance and scope	Lecture, Discussion, Concept Mapping	CLO 1
Environmental science as an interdisciplinary field; major fields	Interactive Lecture, Group Discussion	CLO 2
Environmental problems and their causes	Case Study, Problem-Based Learning	CLO 3
Relationship between environment and living systems	Brainstorming, Diagram Illustration	CLO 4
Basic concept, functions, components, types, and factors of environment	Lecture with Visual Aids, Q&A	CLO 5
Human population as an environmental problem	Lecture, Video Analysis, Debate	CLO 6
Concept of population change, global perspective, sustainability, solutions	Data Analysis, Discussion	CLO 6
Carrying capacity, Gaia hypothesis, population pyramid	Chart Interpretation, Discussion	CLO 7
Agriculture and environment, sustainable agriculture	Case Study, Field Visit, Role Play	CLO 8
Soil fertility, erosion, pollution, sustainable soil management	Hands-on Activity, Infographic	CLO 9
Urbanization and environmental impact; waste management	Group Project, Simulation	CLO 10
Evolution, composition, and structure of atmosphere	Lecture, Animated Video, Quiz	CLO 11
Air pollution, pollutant types, global warming, climate change	Case Discussion, Group Task	CLO 11
Water pollution and its sources	Interactive Lecture, Water Testing Demo	CLO 12
Water quality and treatment methods	Group Work, Experiment Demo	CLO 12
Microbial activities, population, contamination in biosphere	Practical Lab, Model-Based Learning	CLO 13
Heavy metals: sources, properties, toxic effects on environment and organisms	Chart Analysis, Presentation	CLO 14

List of Books:

Adriano, D. C. (2001). *Heavy metals in soils: Trace metals and metalloids in soils and their bioavailability* (2nd ed.). Springer.

Alloway, B. J. (Ed.). (2013). *Heavy metals in soils: Trace metals and metalloids in soils and their bioavailability* (3rd ed.). Springer Dordrecht. https://doi.org/10.1007/978-94-007-4470-7

Botkin, D. B., & Keller, E. A. (2012). *Environmental science: Earth as a living planet* (8th ed.). John

Wiley & Sons, Inc.
Manahan, S. E. (2000). *Environmental chemistry* (7th ed.). Lewis Publishers.
চৌধুরী, বি. এম., & হক, ম. আ. (২০১৩). *পরিবেশবিদ্যা ও পরিবেশ ব্যবস্থাপনা*। ঢাকা: বাংলা একাডেমি।
(Transliteration: Choudhury, B. M., & Haque, M. A. (2013). Poribeshbidya o poribesh bebosthaponay. Dhaka: Bangla Academy.)

Course Code	**213304**	**Marks: 100**	**Credits: 4**	**Class Hours: 60**
Course Title:	**Soil Science Practical**			

Course Objectives:

By the end of the course, students will be able to:

1. **Understand and apply standard safety protocols and precautions in the soil laboratory** to ensure a safe and efficient working environment.
2. **Demonstrate proper techniques for the collection, preparation, labeling, and storage of soil samples** for laboratory analysis.
3. **Determine soil moisture content using the gravimetric method** and interpret its significance in soil-water management.
4. **Measure and analyze soil bulk density and particle density**, and understand their implications on soil porosity and structure.
5. **Prepare accurate standard solutions of commonly used chemicals** such as potassium dichromate ($K_2Cr_2O_7$), oxalic acid, sodium hydroxide (NaOH), and ferrous sulfate ($FeSO_4$) following analytical protocols.
6. **Estimate the organic carbon content in soil using the Walkley and Black wet oxidation method**, and understand its importance in soil fertility assessment.
7. **Determine the soil pH and detect free carbonates**, and evaluate the chemical characteristics influencing soil reaction and crop suitability.

Course Learning Outcomes (CLO):

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

CLO 1	Demonstrate awareness of laboratory safety procedures and apply proper precautions during soil analysis.
CLO 2	Collect, prepare, label, and store soil samples systematically for laboratory investigations.

CLO 3	Determine soil moisture content accurately using the gravimetric method and interpret its practical significance.
CLO 4	Measure and analyze soil bulk density and particle density using standard procedures.
CLO 5	Prepare standard solutions of $K_2Cr_2O_7$, oxalic acid, NaOH, and $FeSO_4$ with accurate concentration calculations and techniques.
CLO 6	Estimate the organic carbon content in soil using the Walkley and Black wet oxidation method and explain its relevance in soil fertility.
CLO 7	Determine soil pH and detect the presence of free carbonates to assess the soil's chemical nature.

Course Contents:

Topic	Teaching-Learning Strategies (TLS)	CLOs
Lab Safety & Protocol: Laboratory safety rules, handling chemicals and glassware, emergency procedures.	Lecture, Video Demo, Safety Manual Review, Discussion	CLO 1
Soil Sample Management: Soil sample collection methods, preparation techniques, labeling, storage, contamination control.	Field Demonstration, Group Activity, Practice in lab	CLO 2
Soil Water Analysis: Gravimetric method for soil moisture determination.	Lab Experiment, Step-by-step Demonstration, Problem Solving Session	CLO 3
Soil Physical Properties: Determination of bulk density and particle density	Laboratory Work, Visual Aids, Calculation Practice, Group Discussion	CLO 4
Solution Preparation: Preparation of standard solutions: $K_2Cr_2O_7$, oxalic acid, NaOH, $FeSO_4$	Hands-on Lab Activity, Calculation Workshops, Instructor-led Demo	CLO 5
Soil Organic Matter Analysis: Wet oxidation (Walkley & Black method) for organic carbon estimation	Laboratory Experiment, Explanation of Soil Fertility Impact, Interpretation Exercises	CLO 6
Soil Chemical Analysis: Determination of soil pH and detection of free carbonates	Lab Work, Use of Indicators/pH meter, Observation & Interpretation	CLO 7

List of Books:

Huq, S. M. I., & Alam, M. D. (2005). *A handbook on analyses of soil, plant and water*. Soil Resource Management, Department of Soil, Water and Environment, University of Dhaka, SWED-Bangladesh.

কাদের, চ. ও নুরজাহান, ন. (বছর অনুপস্থিত). **চাষাবাদ প্রযুক্তি ও চাষাবাদের প্রাকৃতিক নিয়ামক: একটি পরিবেশগত বিশ্লেষণ** [Agronomic Technology and Natural Factors of Cultivation: An Environmental Analysis]. পরিবেশ বিষয়ক গ্রন্থ, গ্লোব পাবলিশিং.

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

Course Objectives:

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:

	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 Contains:

	Topics	Teaching Learning Strategy	CLOs
1	**State of Matter in Chemistry:** Nature and classification of matter. Classical states of solid, liquid, gas and Liqud 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	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 exclusion principle, Hund's rule of maximum multiplicity, electronic configuration of atoms.	Lecture, Group Discussion, Assignment	3, 4, 5
3	**Radiochemistry:** Atomic number and mass number, atomic mass unit, atomic nuleus, 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
5	**Chemical bond:** Definition and casues 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	2, 3, 4, 5
6	**Chemical Reactions:** Physical change and Chemical change, Methods of bringing about chemical reaction, Redox reactions, oxidizing and reducing agents, oxidation state	Lecture, Group Discussion, Assignment	2, 3, 4

	and oxidation number, redox half reactions, rules for balancing redox reactions, acid base reactions.		
7	**Gaseous State:** Vapour and gas, measurable properties of gases, determination of gas pressure, the gas laws: derivation, molcular 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 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, acid-base strength, Salts: Classification and their applications, neutralization reactions.	Lecture, Group Discussion, Assignment	1, 2
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,	Lecture, Group Discussion, Assignment	5, 6

	Alkene and Alkynes. Classification of organic compounds based on their functional groups.		
12	**Aromatic hydrocarbons:** Definition and classification, nucleus and side chain, Structure, preparation and uses of benzene. Aromaticity, Electrophillic 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 and 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. and Boyd, R. N. (1992). *Organic Chemistry*. Benjamin-Cummings Pub Co

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

Robert, J. D., & Caserio, M. C. (1977). *Basic Principles of Organic Chemistry*. W. A. Benjamin, Inc., Menlo Park, CA. ISBN 0-8053-8329-8.

Solomons, T. W. G. (2008). *Fundamental of Organic Chemistry*. Wiley, ISBN: 0471146498, 9780471146490

Course Code	Course Title	Marks	Credits	Class Hours
212810	**Chemistry-I Practical**	**50**	**2**	**30**

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
	CLO5	explain to determination of Fe^{2+}, copper (II), nickel as Ni (HDMG) 2 complex 7 using deference methods.	A4, D1, D2

Course Contains:

	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.	Lecture, Group Discussion, Experimental, Assignment	1-5

	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^{-}.		
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, ISBN: 0632053844, 9780632053841

Skoog, D. A., & West, M. D. (2022). *Fundamental of analytical chemistry*. Publisher, Cengage Learning; ISBN, 1285607198, 9781285607191.

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	**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.

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 *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, 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.

Lampert, W., & Sommer, U. (2023). *Limnoecology: The Ecology of Lakes and Streams* (3rd ed.). Oxford University Press.

Lücking, R., et al. (2021). *Lichens of the World: Diversity, Ecology and Conservation.* CRC Press.

Madigan, M. T., et al. (2022). *Brock Biology of Microorganisms* (16th ed.). Pearson.

Ranker, T. A., & Haufler, C. H. (Eds.). (2020). *Biology and Evolution of Ferns and Lycophytes.* Cambridge University Press.

Simpson, M. G. (2019). *Plant Systematics* (3rd ed.). Academic Press.

Singh, G. (2021). *Plant Systematics: An Integrated Approach* (5th ed.). Science Publishers.

Shaw, A. J., & Goffinet, B. (Eds.). (2020). *Bryophyte Biology* (2nd ed.). Cambridge University Press.

Webster, J., & Weber, R. (2019). *Introduction to Fungi* (4th ed.). Cambridge University Press.

Willis, K. J. (2020). *State of the World's Plants and Fungi.* Royal Botanic Gardens, Kew.

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 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:

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:

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
4. Study of the symptoms and causal organisms of Brown spot of rice and stem rot of Jute.
5. Detailed taxonomic study of the families as included in the theory syllabus.
6. Study of plant and plant parts, and economic uses of angiosperms included in the syllabus.
7. Preparation of herbarium specimens of local plants and submission during examination.
8. Laboratory Note book.

List of Books:

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

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.

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

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

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

রায়, শ্যামল কুমার, নিশীথ কুমার, পাল. এবং মোস্তফা কামাল পাশা. (১৯৯৫) অপুষ্পক উদ্ভিদবিজ্ঞান (১ম), বাংলা একাডেমী, ঢাকা

ইসলাম, এম. রফিকুল, মিহির লাল সাহা এবং এম. এ. বাসার. ২০০৪: অণুজীব বিজ্ঞান, হাসান বুক হাউজ, ঢাকা

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:

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:

Topic	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) • 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) • 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 • 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	Interactive lectures, group discussions, and thematic assignments	CLO 1 CLO 3-4

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)

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: • 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.	Categories of Computer Hardware: Input devices, Processing devices, Output devices, Storage devices Communication devices, Main Processing Devices: The Processor, Control Unit and Arithmetic and	Classroom lectures and Lab

	• 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.	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	
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	Classroom Lectures, Lab, and Hands-on Practice

		Formatting and saving a Word document using the formatting tools: font (style, size, color, etc.), bold, underline, italic, superscript, subscript, 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	Spreadsheet Packages, e.g. Excel Importance of Spreadsheet application in Data Management, Related Concepts and Terminologies (e.g., cell(s), rows, columns,	Classroom Lectures, Lab and Hands-on Practice

	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.	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 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:	Classroom Lectures, Lab and Hands-on Practice

		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	
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, Spyware, Antivirus Software Ethics in the digital world	Classroom Lectures, Lab and Hands-on Practice
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	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:	Classroom Lectures, Lab and Hands-on Practice

	Locators (URLs) to access Information. Use search engines to access information • Upload files to virtual drives and work on it.	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.	
Unit8: Emerging Technologies: Data analytics, Artificial intelligence, Machine learning	• 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.	Introduction to Data Analytics: What is Data? Types of Data, Basic Steps in Data Analytics, Simple Tools; Artificial Intelligence (AI): Making Machines Capable of Performing Tasks that Require Human-Like Thinking.	Classroom Lectures, Lab and Hands-on Practice

	• Discuss benefits and challenges of these technologies. • Recognize current trends and career opportunities in these fields.	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	

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	Lab and Hands-on Practice

		• Prepare a business expenditure report • Prepare payroll management, with a report • Create graphs on the given data • Print Excel files	
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	1. Use of email 2. Access information from the internet, use a search engine. 3. Use of virtual drive for collaboration 4. 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.