

NATIONAL UNIVERSITY

BANGLADESH



First Year Syllabus

Department of Biochemistry and Molecular Biology

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 Biochemistry and Molecular Biology

Programme Educational Objectives (PEOs)

PEO 1: To enable students, participate in the ongoing shaping of knowledge about the application of Biochemistry-based aspects of health, safety and wellbeing and learn to see Biochemistry as one among many forms in Biochemical productivity.

PEO 2: To engage students in independent research and personal development through a combination of multidisciplinary course works and research, in combination with seminar, dialogue, competition, exhibition and other co-curricular activities.

PEO 3: To create the conditions in which students can take responsibility for managing their own learning and get equipped with technical skills and problem-solving ability.

PEO 4: To give students a breadth of socio-cultural exposure that shapes a reflective and critical outlook of diversified professional services based on social responsiveness and awareness as Biochemists.

Programme Learning Outcomes (PLOs):

At the time of graduation, B.Sc. (Honours) in Biochemistry and Molecular Biology students will have achieved the ability to:

PLO 1: Learning: Understand the fundamental principles and concepts of Biology, Biochemistry, Molecular Biology and Natural Sciences allowing the students to think about context-specific problems.

PLO 2: Understanding: Experimental validation of basic biological fundamentals through experimentation and reporting.

PLO 3: Communication: Communicate biochemical concepts, aspects and prospects to stakeholders using state-of-the-art of modern Biochemical tools.

PLO 4: Competency: Ability to identify research and/knowledge gaps and their addressing using the modern tools of Biochemistry and Molecular Biology.

PLO 5: Entrepreneur: Become an entrepreneur of diversified Biochemical services (drug manufacturing, clinical diagnosis, and Healthy Food production), Social and Environmental services (biosafety-biosecurity, environment sustainability, legal-social issues) and lead projects in multidisciplinary professional and non-professional working groups.

PLO 6: Professionalism (Ethics): Understanding, recognizing and practicing the ethical issues (legal and research ethics) in Biochemistry education and research.

PLO 7: Professionalism (Teamwork): Organize, verbally present, and concisely write independent, group or assigned research works (including research projects) in multiple media formats and management.

PLO 8: Life-long learning: Realize the essence of, and have the preparation and ability to engage in independent and life-long learning by applying cutting-edge technology and up-to-date digital tools to solve the health-related problems.

Mapping PEO with PLO:

	PEO-1	PEO-2	PEO-3	PEO-4
PLO-1	√	√		
PLO-2	√	√		

PLO-3				
PLO-4		√	√	
PLO-5		√	√	
PLO-6		√	√	
PLO-7				√
PLO-8				√

Year wise Courses and marks distribution

FIRST YEAR

Course Code	Course Title	Marks	Credits
212901	Introductory Biochemistry	100	4
212903	Biophysical Chemistry	100	4
212905	Bioorganic Chemistry	100	4
212906	Biochemistry Lab-I	100	4
213007	Botany-I	100	4
213008	Botany Lab-I	50	2
213107	Zoology-I	100	4
213108	Zoology Lab-I	50	2
219901	History of Bangladesh: Language, Culture and Identity	100	4
219903	Information and Communication Technology	75	3
219904	Lab: Information and Communication Technology	25	1
	Total =	900	36

Detailed Syllabus

Course Code	212901	Marks:100	Credits: 4	Class Hours: 60
Course Title:	Introductory Biochemistry			

Course Objectives:

- Understand the historical development, scope, and significance of biochemistry in various fields.
- Explain the basic concepts of life, cell structure, and cellular evolution.
- Classify and describe the chemistry and biological roles of carbohydrates and lipids.
- Relate biochemical structures to their physiological and industrial applications.
- Interpret the role of biomolecules in biological systems and diagnostic techniques.

Course Learning Outcomes (CLO):

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

CLO1	Describe the history, development, and interdisciplinary applications of biochemistry.
CLO2	Define and explain the characteristics of living organisms and the concept of life.
CLO3	Illustrate cell structures, organelles, and the evolutionary transitions from molecules to cells.
CLO4	Classify carbohydrates and explain their structures, isomerism, properties, and functions.
CLO5	Distinguish between types of lipids and analyze their structural and functional significance.
CLO6	Classify amino acid and their structures, and functions
CLO7	Classify proteins and explain their structures, properties, and functions.
CLO8	Illustrate protein identification and purification techniques.

Course Contents:

	Topic	Teaching Learning Strategy	CLOs
1	Introduction to Biochemistry: Historical development, scope of biochemistry, applications of biochemistry, and future prospect of Biochemistry.	Lectures, Discussion,	CLO1

		case examples	
2	Life and Living Processes: Concept of life and living processes, identifying characteristics of living matters.	Lectures, Discussion, case examples	CLO2
3	The Cell and Its Evolution: Cell discovery, cell theory, chemical components of a cell, prokaryotic and eukaryotic cells, cell organelles, their function and isolation, eukaryotic cell types, macromolecules.	Lectures, Discussion, case examples	CLO3
4	Carbohydrates: Biological functions of carbohydrates, classification and nomenclature, optical properties, ring structure of common monosaccharides, proof of ring structure of glucose, mutarotation of glucose, general properties and colour test of reducing sugars, important derivatives of monosaccharides, sugar acids. Disaccharides: Maltose, lactose, sucrose and other disaccharides, isolation from natural source, structure and biological importance. Polysaccharides: Storage and structural polysaccharides, structures and functions of starch, glycogen and cellulose, other polysaccharides of biological interests: structure and their functions.	Lectures, Discussion, case examples	CLO4
5	Lipids: nomenclature, classification, general reactions of fats, fatty acids, and sterols, structure and biological functions of different classes of lipids, isolation of cholesterol and phospholipids from natural sources.	Lectures, Discussion, case examples	CLO5
6	Amino acids and peptides: Structural features, optical activity, classification, physio-chemical properties of amino acids and peptides.	Lectures, Discussion, case examples	CLO6
7	Proteins: General introduction to proteins, classification of proteins based on biological functions, shape and structure, isolation, and purification, primary structure of proteins, sequence determination of insulin, sequence homology of homologous proteins, denaturation of proteins. Fibrous proteins: Secondary structure of proteins, protein conformation, alpha keratins, X-ray analysis of	Lectures, Discussion, case examples	CLO7

	keratin, planar peptide bonds, alpha-helix, helix forming and destabilizing amino acids, the insolubility of alpha-keratins, beta-keratins – conformation and structure, structures of collagen and elastin, filamentous proteins – actin, myosin and microtubules. Globular proteins: Tertiary structures of proteins: distinctive tertiary structures of myoglobin, and ribonuclease, renaturation of unfolded and denatured ribonuclease, factors maintaining the tertiary structure of globular proteins, oxygen-binding curves of haemoglobin and myoglobin, the cooperative binding of oxygen by haemoglobin, factors contributing to oxygen saturation curve of hemoglobin, sickle-cell anaemia and its relation to haemoglobin.		
8	Protein purification and characterization: Dialysis and ultrafiltration, density gradient centrifugation, gel filtration, isoelectric precipitation, solvent fractionation, salting-in and salting-out of proteins, electrophoresis, ion-exchange chromatography, selective adsorption, affinity chromatography, minimum molecular weight determination.	Lectures, Discussion, case examples	CLO8

List of Books:

- Champe, P. C., & Harvey, R. A. (2005). *Biochemistry* (Illustrated reviews ed.). Philadelphia, PA: Lippincott Williams & Wilkins.
- Devlin, T. M. (2010). *Textbook of biochemistry with clinical correlations* (7th ed.). Hoboken, NJ: Wiley-Liss.
- Murray, R. K., Granner, D. K., Mayes, P. A., & Rodwell, V. W. (2006). *Harper's biochemistry* (27th ed.). New York, NY: McGraw-Hill Medical.
- Nelson, D. L., & Cox, M. M. (2017). *Lehninger's principles of biochemistry* (7th ed.). New York, NY: W. H. Freeman.
- Stryer, L. (2019). *Biochemistry* (9th ed.). New York, NY: W. H. Freeman and Company.

Course Code	212903	Marks:100	Credits: 4	Class Hours: 60
Course Title:	Biophysical Chemistry			

Course Objectives:

- Understand atomic structure, chemical bonding, and periodic properties of elements relevant to biological molecules.
- Explain thermodynamic and thermochemical principles in the context of biological systems.
- Describe gas, liquid, and solution behaviors and their significance in biological processes.
- Understand acid-base concepts, buffer systems, and equilibrium relevant to biochemistry.
- Apply spectrophotometric principles for analyzing biomolecules.

Course Learning Outcomes (CLO):

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

CLO1	Describe atomic structure, periodic properties, and chemical bonding relevant to biomolecular interactions.
CLO2	Apply the laws of thermodynamics and thermochemistry to understand biochemical energy transformations.
CLO3	Analyze physicochemical properties of gases, liquids, and solutions with relevance to biological systems.
CLO4	Interpret acid-base behavior and buffer mechanisms in biological contexts.
CLO5	Understand properties of liquids
CLO6	Utilize spectrophotometric techniques to quantify and assess biochemical substances.

Course Contents:

	Topic	Teaching Learning Strategy	CLOs
1	Atomic Structure: Fundamental particles, atomic number, atomic mass, atomic weight, atomic models, wave mechanics and atomic orbital, De-broglie relationship, Heisenberg uncertainty principle, Schrodinger wave equation, quantum theory, Pauli's exclusion principle, Hund's rule, Aufbau principle, electronic configuration of atoms, types of hybridization.	Lecture, Assignment	CLO1

2	Periodic Properties: Periodic tables, periodicity with reference to atomic size, ionization potential, electron affinity and electronegativity.	Lecture, Assignment	CLO1
3	Thermodynamics: First law of thermodynamics: Introduction, definitions, nature of heat and work, PV work, maximum work, first law of thermodynamics - internal energy, enthalpy, molar heat capacities, isothermal and adiabatic expansion. Thermochemistry: Exothermic and endothermic reactions, standard enthalpy of formation, thermochemical equations, reaction enthalpy - dependence on temperature, bond energies. Second law of thermodynamics: Thermodynamics - reversibility and irreversibility, spontaneous processes, entropy, thermodynamic efficiency and Carnot's theorem, statements of second law, entropy changes - phase transition, heating, irreversible processes. Third law of thermodynamics: Free energy - variation with temperature and pressure, Gibbs-Helmholtz equation, applications of thermodynamics in biochemistry, biochemical relevance of classical thermodynamics, open systems.	Lecture, Group Discussion, Assignment	CLO2
4	Chemical equilibrium: The nature of chemical equilibrium, law of mass action, equilibrium constant, relationship between ΔG and K_{eq} , effect of temperature and pressure, Le Chatelier principle, equilibrium reaction involving protons, coupling of reactions. Applications in living systems.	Lecture, Group Discussion, Assignment	CLO3
5	Chemical Kinetics: Definition, reaction rate, rate laws, zero-, first- and second-order reactions, molecularity of a reaction, pseudo first order reaction, half-life, determination of order and rate constant, effect of temperature on reaction rates. Theories of reaction rates - the collision theory, the activated complex theory.	Lecture, Group Discussion, and Assignment	CLO3

	Catalysis: Definition, types, characteristics of catalysts, activation energy and catalysis.		
6	Acids and bases: Bronsted-Lowry concept, Lewis's concept, strengths of acids, weak acids and bases, pH, buffer solutions. Henderson-Hasselbalch equation, buffering against pH changes in biological systems, maintaining the pH of blood, acid-base indicators, acid base titration, choice of a suitable indicator.	Lecture, Group Discussion, Assignment	CLO4
7	Properties of liquids: Introduction – the kinetic molecular description, intermolecular forces in liquids, dielectric constant, surface tension, viscosity, diffusion, osmotic pressure, phase rule, phase diagram of water, ionization of water, water as a reactant.		CLO5
8	Spectrophotometry: Beer-Lambert law, standard curves, working principle of a spectrophotometer, application in biochemistry.		CLO6

List of Books:

Bahl, B. S., Tuli, G. D., & Bahl, A. (2022). *Essentials of physical chemistry* (28th ed.). S. Chand & Company Ltd.

Chang, R. (1977). *Physical chemistry with applications to biological systems*. Macmillan Publishing Co.

Glasstone, S. (1946). *Textbook of physical chemistry* (2nd ed.). D. Van Nostrand Company.

Glasstone, S., & Lewis, D. (1963). *Elements of physical chemistry* (2nd ed.). Macmillan Pres

Course Code	212905	Marks:100	Credits: 4	Class Hours: 60
Course Title:	Bioorganic Chemistry			

Course Objectives:

- Understand the structure, bonding, nomenclature, and reactivity of aliphatic and aromatic organic compounds.
- Explain the mechanisms and applications of fundamental organic reactions, including substitution, addition, elimination, and condensation.
- Relate the chemical properties of organic compounds to their biological functions and industrial uses.

- Analyze reaction mechanisms and predict the outcomes of organic transformations.
- Apply principles of organic chemistry to understand bioorganic molecules and their relevance in biochemistry and biotechnology.

Course Learning Outcomes (CLO):

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

CLO1	Describe the structure, nomenclature, and classification of organic compounds, including bioorganic molecules.
CLO2	Explain the reaction mechanisms of key organic transformations such as SN1, SN2, E1, E2, Diels-Alder, and others.
CLO3	Understand alcohols, ethers, aromaticity, aldehydes and ketones
CLO4	Analyze the chemical behavior of Carboxylic acids and their derivatives.
CLO5	Understand the chemical properties of Carboxylic acids and their derivatives

Course Contents:

Week	Topic	Teaching Learning Strategy	CLOs
1	Organic Compounds: Introduction, and overview of organic chemistry. Aliphatic Compounds: Overview of aliphatic compounds; structure, bonding, and nomenclature of aliphatic compounds.	Lecture, Assignment	CLO1
2	Alkanes, Alkenes and Alkynes: Occurrence, structure, and nomenclature of alkanes, alkenes and alkynes, Physical and chemical properties of alkanes, alkenes and alkynes, Mechanisms of halogenation and free radical reactions of alkanes, alkenes and alkynes. Alkyl Halides: Occurrence, structure, and synthesis of alkyl halides. Nucleophilic substitution reactions (SN1 and SN2). Carbocations, carbocation rearrangement. E1 and E2 elimination reactions. Organometallic compounds: Grignard reagents. Detailed mechanisms of SN1, SN2, E1, and E2 reactions. Uses of alkyl halides and Grignard reagents in organic synthesis.	Lecture, Assignment	CLO2

3	Alcohols, ethers, epoxides and diols: Occurrence, nomenclature, structure, synthesis, physical and chemical properties and uses. Dienes: Structure and properties of 1, 3-butadiene, addition reactions, polymerization, Diels-Alder and other reactions of dienes.	Lecture, Group Discussion, Assignment	CLO3
4	Aromaticity: Structure of benzene, sources of aromatic hydrocarbons, industrially important aromatic compounds, nomenclature of benzene derivatives, electrophilic and nucleophilic aromatic substitution, chemistry of aromatic aliphatic compounds.	Lecture, Group Discussion, Assignment	CLO3
5	Aldehydes and ketones: Nomenclature, synthesis, nucleophilic addition, elimination reaction, oxidation and reduction of carbonyl compounds, haloform reaction, enolisation in biological system, α-halocarbonyl compounds, aldol condensation, benzoin condensation, Claisen condensation, crossed aldol and crossed Claisen condensation, perkin condensation. Witting reaction, Reformatsky reaction, α, β-unsaturated carbonyl compounds.	Lecture, and Assignment	CLO3
6	Carboxylic acids and their derivatives: Nomenclature, synthesis, classification, properties, reactions, uses, decarboxylation reactions, dicarboxylic acids, esters.	Lecture, Group Discussion, Assignment	CLO4
7	Nitro-compounds and amines: Occurrence, nomenclature, synthesis, classification, properties, reactions, uses, diazonium compounds.	Lecture, Group Discussion, Assignment	CLO4
8	Phenols: Occurrence, nomenclature, synthesis, properties and reactions, polyhydric phenols.	Lecture, Group Discussion, Assignment	CLO5
9	Heterocyclic Compounds: reactions, classification and synthesis of heterocyclic compounds with special reference to – pyrroles, purines and pyrimidines.	Lecture, Group Discussion, Assignment	CLO5

List of Books:

- Finar, I. L. (1996). *Organic chemistry* (Vols. 1–2, 5th ed.). London, UK: English Language Book Society & Longman Group Ltd.
- Hart, H., & Schuetz, R. D. (1978). *Organic chemistry: A short course* (3rd ed.). Boston, MA: Houghton Mifflin Company.
- Kavanah, P., Robbins, J., & Oberkrieser, J. (1982). *Concepts in modern chemistry*. New York, NY: Globe Fearon Company.
- Morrison, R. T., & Boyd, R. N. (1959). *Organic chemistry*. Boston, MA: Allyn & Bacon.
- Ternay, A. L. (1976). *Contemporary organic chemistry*. Philadelphia, PA: W. B. Saunders Company.

Course Code	212906	Marks:100	Credits: 4	Class Hours: 60
Course Title:	Biochemistry Lab-I			

Course Objectives:

- Perform basic microscopic techniques for examining plant and animal cells.
- Conduct qualitative tests for detecting major biomolecules such as proteins, carbohydrates, and lipids.
- Identify and differentiate various types of sugars using standard biochemical tests.
- Record, interpret, and analyze experimental results effectively in a laboratory setting.

Course Learning Outcomes (CLO):

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

CLO1	Demonstrate the ability to prepare and observe plant and animal cells under a microscope.
CLO2	Estimation of copper, acid in different compounds, calcium, iron, ascorbic acid
CLO3	Identification of organic compounds and colour tests for biomolecules.
CLO4	Separation of amino acid mixture by paper chromatography

Course Contents:

	Topic	Teaching Learning Strategy	CLOs
1	Introduction to laboratory safety, equipment, and microscopy basics.	Lectures, Demonstration, group discussion.	CLO1
2	Preparation of standard solutions.	Lectures, Demonstration, group discussion.	CLO1
3	Standardisation of HCl.	Lectures, Demonstration, group discussion.	CLO1
4	Estimation of acetic acid content of vinegar.	Lectures, Demonstration, group discussion.	CLO2
5	Estimation of calcium by the permanganate method.	Lectures, Demonstration, group discussion.	CLO2
6	Estimation of iron content of Mohr's salt by the dichromate method.	Lectures, Demonstration, group discussion.	CLO2
7	Estimation of copper by iodometry.	Lectures, Demonstration, group discussion.	CLO2
8	Estimation of ascorbic acid content of biological samples.	Lectures, Demonstration, group discussion.	CLO2
9	Identification of organic compounds and colour tests for biomolecules.	Lectures, Demonstration, group discussion.	CLO3
10	Separation of amino acid mixture by paper chromatography	Lectures, Demonstration, group discussion.	CLO4

List of Books:

Vogel, A. I. (1959). *Textbook of organic chemistry* (3rd ed.). Allyn and Bacon Inc.

Vogel, A. I., & Furniss, B. S. (1989). *Vogel's textbook of practical inorganic chemistry* (5th ed.).

English Language Book Society & Longman Group Ltd.

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 <i>Saccharomyces</i> . e. Cyanobacteria: Habitat, characteristics, structure, importance of Cyanobacteria. f. Algae: Habitat, characteristics, classification up to class (Fritsch), reproduction, importance; life history of <i>Oeodogonium</i> . g. Phytoplankton: Habitat, characteristics, classification and importance.	Lecture, Group discussion, Video presentations	CLO2

3. Lichen: Habitat, characteristics, classification and importance.	Illustrated lecture, Model demonstration	CLO2
4. Limnology: Definition, scope, importance and classification of lakes.	Chalk-talk, Diagrams, Group activities	CLO3
5. Bryophyta: Habitat, characteristics, classification up to classes and reproduction; life history of Riccia and Anthoceros.	Lecture with images, Case studies	CLO3
6. Pteridophyta: Habitat, characteristics, classification up to classes, importance; life history of Selaginella and Christella.	Hands-on lab, Lecture	CLO3
7. Gymnosperms: Habitat, characteristics and importance; life history of Cycas and Gnetum.	Illustrated discussion, Lab demo	CLO3
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	CLO3
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	CLO4

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	CLO5
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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.

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

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: 10

Cyanobacteria:	<i>Nostoc, anabaena</i>
Algae:	<i>Saccnaromyces and Accoboious</i>
Bryophyte:	<i>Riccia and Marchantia</i>
Pteridophyte:	<i>Selaginella, Christella</i>
Gymnosperms:	<i>Cycas</i>
Angiosperm:	Poaceae and Fabaceae

2. Identification of the following genera with reasons: 06

Algae:	<i>Volvox, Polysiphonea and Fucas.</i>
Fungi:	<i>Rhizopus, A garicus, Puccinia and Penicillium.</i>
Lichen:	<i>Crustose, Foliose and Fructose.</i>
Bryophyte:	<i>Anthoceros, Semibarbula.</i>
Pteridophyte:	<i>Selaginella, Marsilea, Azolla and Pteris</i>
Gymnosperms	Male and female cones of <i>Cycas</i>
Angiosperms:	Scientific names of common plants around the institution.

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.

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.). *Mouluka botany* (Vols. 1, 2, & 3).

রায়, শ্যামল কুমার, নিশীথ কুমার, পাল. এবং মোস্তফা কামাল পাশা. (১৯৯৫) অপুস্পক উদ্ভিদবিজ্ঞান (১ম), বাংলা একাডেমী, ঢাকা
ইসলাম, এম. রফিকুল, মিহির লাল সাহা এবং এম. এ. বাসার. ২০০৪: অণুজীব বিজ্ঞান, হাসান বুক হাউজ, ঢাকা

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

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 Outcomes (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.

Course Contents:

Topic	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, Ciliophora, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Gastrotricha, Nematomorpha, Rotifera, <i>Trypanosoma</i>, <i>Leishmania</i>, <i>Amoeba</i>, <i>Monocystis</i>, <i>Nosema</i>, <i>Spongilla</i>, <i>Adamsia</i>, <i>Fasciola</i>, <i>Schistosoma</i>, <i>Convoluta</i>, <i>Diphyllbothrium</i>, <i>Ancylostoma</i>, <i>Enterobius</i>, <i>Wuchereria</i>, <i>Loa</i>, <i>Trichuris</i>, <i>Loligo</i>, <i>Octopus</i>, <i>Mytilus</i>, <i>Sepia</i>, <i>Tubifex</i>, <i>Limulus</i>, <i>Eupagurus</i>, <i>Squilla</i>, 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: <i>Euglena</i> b. Phylum Ciliophora: <i>Paramecium</i> c. Phylum Porifera: <i>Scypha</i> d. Phylum Cnidaria: <i>Obelia</i> e. Phylum Nematoda: <i>Ascaris</i> f. Phylum Platyhelminthes: <i>Taenia</i> g. Phylum Mollusca: <i>Pila</i> h. Phylum Arthropoda: Prawn i. Phylum Echinodermata: <i>Astropecten</i> j. Phylum Hemichordata: <i>Balanoglossus</i>.	Lecture, Group Discussion, and tutorial sessions	CLO1
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.	Lecture, Group Discussion, Assignments and Field visit	CLO4 CLO5

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.		
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List of Books:

- Campbell, N., & Reece, J. (2005). *Biology*, 7th edn. 2005, Pearson.
- Gaston, K. J., & Spicer, J. I. (2013). *Biodiversity: An Introduction*. 2nd edition. 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 edition. 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, প্রফেসর মোঃ নাজিম. (২০০৪). *স্নাতক প্রাণিবিজ্ঞান, (প্রোটোজোয়া এবং নন-কর্ডেটা)*, নিসর্গ প্রকাশনী-বাংলা বাজার, ঢাকা।
- দত্ত, স্বপন কুমার এবং অন্যান্য (২০০৪). *প্রাণিবৈচিত্র-প্রথম খণ্ড-অমেরুদণ্ডী প্রাণী*, মল্লিক ব্রাদার্স-বাংলা বাজার, ঢাকা।
- হোসেন, আলতাফ এবং অন্যান্য (২০০৩). *প্রাণিবিজ্ঞান পরিচিতি*, মল্লিক ব্রাদার্স, বাংলাবাজার, ঢাকা

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

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:

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

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

Course Objectives:

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

Course Learning Outcomes: The student will be able to:

CLO 1	Explain foundational ICT concepts, including the information processing cycle.
CLO 2	Operate standard computer hardware and software systems effectively.

CLO 3	Use office productivity tools (Word, Excel, PowerPoint) for academic and professional tasks.
CLO 4	Apply safe internet practices and use internet tools for communication and information retrieval.
CLO 5	Understand and explain the concepts of Data Analytics, Artificial Intelligence (AI), and Machine Learning (ML)
CLO 6	Understand the concept of free-lancing

Course Contents:

Unit	Specific Objectives	Content	Teaching and Learning Approach
Unit 1: Introduction to Information and Communications Technology (ICT) and Computer System	The student will be able to: • 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,	Categories of Computer Hardware: Input devices, Processing devices, Output devices, Storage devices Communication devices, Main Processing Devices: The Processor, Control Unit and	Classroom lectures and Lab

	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.	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	
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. Introduction of Microsoft Word Software. File creation and saving: New, Save, Open, Save As. Editing: Copy/Cut, Paste, Undo, Redo, Find, Replace, Clipboard, Sub-Headings and Paragraphs, Text Correction, Wrapping Text, Text Orientation Formatting: Font: Style, Size, Color, Bold, Underline, Italic, Superscript, Subscript, Shadow, Strikeout. Paragraph: Alignment, Bullet & Numbering, Indent, Line Spacing, Table Border Insert: Table, Picture, Shape, Smart Art, Chart, Header, Footer, Page Number, WordArt, Drop Cap, Symbols, Equations, Hyperlink, Comment. Page Design: watermark, page border	Classroom Lectures, Lab, and Hands-on Practice

		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) Excel Tool Bars: Formatting Bar, Standard Bar, Formula Bar. Types of Data and Their Uses (e.g., number, date, text, currency), Creating and Saving a Workbook, Formula and Functions, Sorting, filtering, validation, creating pivot table. Formatting Worksheet Using Formatting Tools. Draw Graph/chart, Printing Worksheet.	Classroom Lectures, Lab and Hands-on Practice
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,	Presentation Applications Packages, Devices used for Presenting, Importance of Presentation Application, Principles for Designing Presentations, Terminologies in Presentation Application (eg;, Slide transitions, Slide show, etc.), Commonly Used Features of Presentation Application Window: Toolbars, Different presentation view modes Prepare a Presentation: Slide creating, editing, theme,	Classroom Lectures, Lab and Hands-on Practice

	animation effects to slides • Select the print option for printing. • Prepare a presentation on a selected topic and present it.	background, inserting elements (image, audio, video hyperlink, table, smart art, graph, etc.) and formatting slides, Slide Layout, slide Show, slide transition, animation Effects. Selection of Print Option: Entire presentation, Specific slides, Handouts, Notes pages, outline view of slides.	
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 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	Classroom Lectures, Lab and Hands-on Practice

		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.	
Unit 8: 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. • Discuss benefits and challenges of these technologies. • Recognize current trends and career opportunities in these fields.	Introduction to Data Analytics: Define Data, Types of Data, Define Data Analytics, Basic Steps in Data Analytics, Applications of Data Analytics, Common Tools of Data Analytics (Excel, Tableau, Power BI, Python, SQL, etc.). Artificial Intelligence (AI): Define AI, Objectives of AI, AI capabilities, AI applications (NLP, Image Recognition, Predictive Analytics, Recommender Systems, Robotics, etc.); AI Tools: OpenAI GPT, TensorFlow, PyTorch, Keras, Scikit-learn, etc.), AI in daily life (Voice assistants, facial recognition, GPS route suggestions, chatbots, etc.) . Machine Learning (ML): Define Machine Learning	Classroom Lectures, Lab and Hands-on Practice

		(ML), How It Works, Classification of ML, applications of ML, and common ML platforms (Teachable Machine, TensorFlow, PyTorch, Microsoft Azure Machine Learning, etc.). Relationship Between Data Analytics, AI, and ML Benefits & Challenges of Data Analytics, AI, and ML. Future Trends & Career Paths.	
Unit 9: Introduction to Freelancing	The student will be able to: • Define and explain the fundamental concept and significance of freelancing in the global context. • Identify and categorize various online marketplaces and professional fields. • Develop professional profiles, portfolios, and proposals suitable for freelancing platforms. • Demonstrate the use of online payment systems and financial transaction methods. • Analyze and evaluate strategies for career development and effectively apply techniques to overcome freelancing challenges.	Introduction and Basic Concepts, Fields of Freelancing, Essential Skills and Preparation, Introduction to Freelancing Marketplaces, Creating Profile and Portfolio, Earning and Transaction Process, Building a Freelancing Career, Challenges and Solutions.	Classroom Lectures, Practical Demos, Assignments, Discussions

List of Books:

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

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

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

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

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

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

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

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

Course Objectives:

The main objective of the course is to teach the students' understanding and skills in using, and applying technology to solve problems and enhance various aspects of life and work. It includes assembling hardware, installing software, preparing PPT slides, and producing Word and Excel documents.

Course Learning Outcomes:

The student will be able to:

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

List of Experiments

CLO Addressed	Unit	Experiments	Teaching Learning Approach
CLO1	1-4	- 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	Lab and Hands-on Practice
CLO6	8	- Data Collection and Visualization (Excel) - Simple Prediction (Excel) - Pattern recognition (Teachable Machine) - Classification (Teachable Machine)	Lab and Hands-on Practice

		1.	
CLO7	9	2. Free lancing • Marketplace exploration and portfolio creation • Proposal writing • Payment simulation	Lab, Hands-on, Group Work, Discussion

Instructions for the Lab:

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

Instructions for the Lab exam:

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

List of Books:

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

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