Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. in Critical Care Technology
Effective from academic session 2024-25

Semester-I

Course Name: BASICS OF HUMAN ANATOMY

Mode: Offline

Credits: 5 (3T+2P)

BMICCT 101 & 191

Aim of the course:

The aim is to achieve knowledge of human anatomy and its features as a whole.

Course Objective:

1. Demonstrate the anatomical terms, organization of the human body, and structure of cells, tissue, membranes, and glands.

2. Demonstrate the structure and functions of bones and joints.

3. Demonstrate the structure and functions of the respiratory system.

4. Demonstrate the structure and functions of the cardiovascular system.

5. Demonstrate the structure and functions of the central nervous system.

6. Demonstrate the structure and functions of the abdomen.

Course Outcome:

Sr no.	Graduate attributes	Mapped Modules
CO 1	Ability to gain a comprehension of the organization of the human body and the structure of cells, tissue, membranes, and glands.	Module I
CO 2	Ability to demonstrate the structure and functions of bones and joints.	Module II
CO 3	Ability to demonstrate the structure and functions of the respiratory system.	Module III
CO 4	Ability to comprehend the structure and functions of the cardiovascular system.	Module IV
CO 5	Ability to demonstrate the structure and functions of the central nervous system.	Module V
CO 6	Ability to comprehend the structure and functions of the excretory system.	Module VI
CO 6	Ability to comprehend the structure and functions of the abdomen.	Module VII

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Learning Outcome/ Skills:

Demonstrate a broad knowledge of human anatomy

- Develop an in-depth and thorough understanding of human anatomy at the macroscopic level, including systems-based and regional anatomy.
- Develop an understanding of neural systems organization, cellular neurobiology, and topographic and vascular anatomy of the spinal cord, brain, and cerebrum.
- Develop a microscopic-level comprehension of human tissue, including the structure, function, and organization of cells and tissues.
- Evaluate and assess the developmental process of human embryonic and foetal periods, analyze congenital abnormalities, and integrate embryology to adult human gross anatomy.

Module Number	**Content**	**Total Hours**	**% of questions**	**Bloom Level (applicable)**	**Remarks, if any**
THEORY					
M I	INTRODUCTION TO HUMAN ANATOMY	6	15		NA
M II	MUSCULOSKELETAL SYSTEM	6	15		NA
M III	RESPIRATORY SYSTEM	7	20		NA
M IV	CARDIOVASCULAR SYSTEM	7	20		NA
M V	CENTRAL NERVOUS SYSTEM	7	10		NA
M VI	EXCRETORY SYSTEM	6	10		NA
M VII	ABDOMEN	6	10		NA
Total Theory		45	100		
PRACTICAL		30			
	TOTAL	75			

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Detailed Syllabus

MODULE I: INTRODUCTION TO HUMAN ANATOMY [6L]

Unit 1: Basic Anatomical Terminology, planes, body positions, relations

Unit 2: Human Cell Structure

Unit 3: Tissue – definition, types, characteristics, classification, location, functions & Formation

Unit 4: Membranes and glands – classification and structure

MODULE II: MUSCULOSKELETAL SYSTEM [6L]

Unit 1: Upper Limb: Clavicle, Scapula, Humerus, Radius, Ulna, Hand

Unit 2: Muscles, blood supply, nerve supply of upper limb

Unit 3: Lower Limb: Femur, pelvis, Sacrum, Tibia, Fibula, and Vertebral column

Unit 4: Muscles, blood supply, nerve supply of upper limb

MODULE III: RESPIRATORY SYSTEM [7L]

Unit 1: Thoracic cage anatomy: Thoracic cage, ribs, sternum, thoracic vertebrae, Diaphragm,

intercostal muscles, muscles of the back, Pleura, Blood supply, nerve supply, lymphatics

Unit 2: Upper respiratory anatomy: Nose, nasopharynx, Oral cavity, oropharynx, Pharynx, larynx,

Blood and nerve supply

Unit 3: Lower respiratory anatomy: Trachea to the bronchial tree, Lungs with broncho-pulmonary

segments and surface anatomy, Bronchial circulation, and nerve supply.

MODULE IV: CARDIOVASCULAR SYSTEM [7L]

Unit 1: Heart and valves, pericardium, endocardium, myocardium, surface anatomy

Unit 2: Major vessels of circulatory system: Aorta, Pulmonary vessels, IV and major branches

Unit 3: Coronary circulation.

MODULE V: CENTRAL NERVOUS SYSTEM [7L]

Unit 1: Organization of the CNS: Central nervous system: Brain and spinal cord, Peripheral nervous

system, Autonomic nervous system - Sympathetic system, Parasympathetic system

Unit 2: Cerebral circulation: Circle of Willis, Blood supply of the spinal cord

Unit 3: Pain pathway.

MODULE VI: EXCRETORY SYSTEM [6L]

Unit 1: Kidney, ureter, bladder

Unit 2: Blood supply and innervation

MODULE VII: ABDOMEN [6L]

Unit 1: Liver, pancreas, Islets

Unit 2: Thyroid, parathyroid, adrenals

PRACTICALS IN ANATOMY [30P]

I. Osteology

II. Surface Anatomy

III. Visceral Detection

IV. Radiology

Suggested Reading:

1. Cohen, Memmler: Structure & Function of Human Body, Lippincott Williams & Wilkins; Tenth edition (2012)

2. Waugh: Ross & Wilson Anatomy & Physiology in health and illness Penguin Books Ltd (2010)

3. Tortora: Anatomy & Physiology, John Wiley & Sons (2012)

4. Chaurasia: Human Anatomy CBS Publishers (2012)

5. Standring: Gray's Anatomy Penguin Books Ltd (2008)

6. Samar Mitra: Human Anatomy Vol – I, II, III.

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Course Name: BASICS OF HUMAN PHYSIOLOGY

Mode: Offline

Credits: 5 (3T+2P)

BMICCT 102 & 192

Aim of the course:

The aim is to achieve knowledge of human physiology and its features as a whole.

Course Objective:

1. Demonstrate the physiology of cells, tissues, membranes, and glands.
2. Demonstrate the physiology of blood and the functions of the heart.
3. Demonstrate blood cell count, coagulation, grouping, Hb; BP, and Pulse Monitoring
4. Demonstrate the physiology and mechanism of respiration.
5. Demonstrate spirometry and Central Nervous System
6. Demonstrate Digestive System
7. Demonstrate the physiology of the excretory system
8. Demonstrate the functions of the Endocrine System
9. Define the basics of the Reproductive System

Course Outcome:

Sr no.	Graduate attributes	Mapped Modules
CO 1	Ability to comprehend the physiology of cells, tissues, membranes, and glands	MODULE I
CO 2	Ability to demonstrate physiology and functions of heart.	MODULE II
CO 3	Ability to determine blood cell count, coagulation, grouping, Hb; BP and Pulse monitoring.	MODULE III
CO 4	Ability to comprehend physiology and mechanism of respiration.	MODULE IV
CO 5	Ability to demonstrate spirometry and functions of Central Nervous System.	MODULE V
CO 6	Ability to comprehend physiology and anatomy of Digestive system.	MODULE VI
CO 7	Ability to comprehend physiology of excretory system	MODULE VII

CO 8	Ability to comprehend the functions of Endocrine System	MODULE VIII
CO 9	Ability to comprehend the basics of Reproductive System	MODULE IX

Learning Outcome:

1 Describe the basic structural and functional features of the major organ systems within the human body.

2 Define basic biological processes essential for the maintenance of homeostasis.

3 Correlate specific structural features of human cells, tissues, organs, and systems of the human body with their normal functions, and identify the changes that occur during human development, aging, and disease.

4 Work in teams to apply their knowledge to investigate clinical scenarios and debate current topics in scientific research.

5 Develop research skills including critical analysis, interpretation, synthesis, and communication of scientific data.

6 Develop and display the motivation necessary for ongoing independent learning.

Module Number	**Content**	**Total Hours**	**% of questions**	**Bloom Level (applicable)**	**Remarks, if any**
THEORY					
M I	THE CELL	5	10		NA
M II	CARDIOVASCULAR SYSTEM	5	10		NA
M III	BLOOD	5	20		NA
M IV	RESPIRATORY SYSTEM	5	10		NA
M V	CENTRAL NERVOUS SYSTEM	5	10		NA
M VI	DIGESTIVE SYSTEM	5	10		NA
M VII	EXCRETORY SYSTEM	5	10		NA
M VIII	ENDOCRINE SYSTEM	5	10		NA
M IX	REPRODUCTIVE SYSTEM	5	10		NA

Total Theory		45	100		
PRACTICAL		30			
TOTAL		75			

Detailed Syllabus

MODULE I: THE CELL [5L]

Unit 1: Cell structure and functions of the various organelles, Endocytosis, and exocytosis

Unit 2: Acid-base balance and disturbances of acid-base balances (alkalosis, acidosis)

MODULE II: CARDIOVASCULAR SYSTEM [5L]

Unit 1: Physiology of heart

Unit 2: Heart sounds, auscultatory areas

Unit 3: Cardiac cycle, cardiac output and factors affecting cardiac output, stroke volume,

contractility, preload, after load

Unit 4: O2 delivery, uptake to tissues

Unit 5: Cardiac conduction system, Regulation of rate, basic arrhythmias

Unit 6: Arterial pressure, Blood pressure, Hypertension, hypotension: Blood pressure - Maintenance

of normal BP and factors affecting it, Systolic, diastolic, pulse pressure, mean arterial pressure

Unit 7: Electrocardiogram: Principles of ECG, Normal ECG

MODULE III: BLOOD [5L]

Unit 1: Homeostasis

Unit 2: Composition of blood, functions of blood and plasma proteins, classification of protein.

Unit 3: Pathological and Physiological variation of the RBC, WBCs, platelets

Unit 4: Functions of hemoglobin

Unit 5: Erythrocyte sedimentation rate

Unit 6: Detailed description of WBC, TC, DC & functions

Unit 7: Platelets: Formation, normal level, and functions

Unit 8: Blood group and Rh factor

MODULE IV: RESPIRATORY SYSTEM [5L]

Unit 1: Physiology of breathing: Regulation of breathing, Respiratory movements, Mechanics of breathing, muscle action - Pressure, volume, Resistance, compliance, Definition, and normal values of lung volumes and lung capacities, Lung volumes & capacity.

Unit 2: Gas exchange & transport - oxygen, CO2: Diffusion, Gas exchange, mechanism of diffusion, O2 transport & abnormalities, Factors affecting O2 transport, CO2 transport & abnormalities.

Unit 3: Work of breathing, pulmonary function tests

Unit 4: Acid-base balance, ABG

MODULE V: CENTRAL NERVOUS SYSTEM [5L]

Unit 1: Function of CSF, Intracranial pressure

Unit 2: Metabolic requirements of the brain, Cerebral autoregulation

Unit 3: Consciousness

Unit 4: Basic function of the eyes: light reflex, movements

Unit 5: Cough and gag reflex

MODULE VI: DIGESTIVE SYSTEM [5L]

Unit 1: Physiological and Anatomy of the GIT

Unit 2: Food digestion in the mouth, stomach, and intestine

Unit 3: Absorption of foods

Unit 4: Role of bile in the digestion

MODULE VII: EXCRETORY SYSTEM [5L]

Unit 1: Normal urinary output, Micturition

Unit 2: Renal function tests, renal disorders

MODULE VIII: ENDOCRINE SYSTEM [5L]

Unit 1: Function of pituitary

Unit 2: Thyroid

Unit 3: Parathyroid Hormones

Unit 4: Adrenal / Pancreatic

MODULE IX: REPRODUCTIVE SYSTEM [5L]

Unit 1: Formation of semen & spermatogenesis

Unit 2: Brief account of the menstrual cycle

PRACTICALS IN PHYSIOLOGY [30P]

I. Microscope

II. Blood group

III. Measurement of BP

IV. Measurement of PR, HR &RR

V. Examination of the eye/pupil

VI. Cough and gag reflex

VII. Examination of the respiratory system

Suggested Readings:

1. Cohen, Memmler: Structure & Function of Human Body, Lippincott Williams & Wilkins; Tenth

edition (2012).

2. Waugh: Ross & Wilson Anatomy & Physiology in health and illness Penguin Books Ltd (2010).

3. Tortora: Anatomy & Physiology, John Wiley & Sons (2012).

4. Venkatesh D: Basics of Medical Physiology for Nursing, LWW (2009).

5. Hall J: Guyton Textbook of Medical Physiology. Elsevier (2012)

6. CC Chatterjee: Human Physiology Vol. 1&2

7. Mahapatra: Human Physiology.

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Semester-II

Course Name: BASIC CRITICAL CARE MANAGEMENT

[BASICS OF NURSING, ANAESTHESIA, SURGERY]

Mode: Offline

Credits: 5

BMICCT 201

Aim of the course:

The aim is to achieve knowledge of the basics of nursing, anesthesia, surgery, and its features as a whole.

Course Objective:

1. The objective of the course is to help individuals acquire proficiency in using their skills for treating critically ill patients.
2. It is designed to provide foundational knowledge and skills to nursing professionals who are working or aspiring to work in critical care settings.
3. This course aims to equip nurses with the necessary competencies to effectively care for patients with life-threatening conditions and those requiring intensive monitoring and interventions.
4. To introduce learners to the fundamental principles of anesthesia, including the pharmacology of anesthetic agents, their mechanisms of action, and considerations for drug selection based on patient conditions.
5. To familiarize learners with the various anesthesia machines, monitors, and equipment used in critical care settings. This includes understanding how to interpret and respond to data from monitoring devices during anesthesia administration.
6. It is designed to provide healthcare professionals, with essential knowledge and skills to care for patients who have undergone surgery and require intensive monitoring and management in a critical care setting.

Sr no.	**Graduate attributes**	**Mapped Modules**
CO 1	Ability to comprehend the different patient care techniques.	MODULE I
CO 2	Ability to demonstrate the patient care equipment.	MODULE II
CO 3	Ability to determine different types of anesthesia processes.	MODULE III
CO 4	Ability to comprehend various instruments related to anesthesia.	MODULE IV
CO 5	Ability to demonstrate about basics of surgery.	MODULE V
CO 6	Ability to comprehend the different post-surgical management	MODULE VI

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Learning Outcome:

1. The learning outcomes of the basics of nursing in critical care nursing are aimed at equipping healthcare professionals with fundamental knowledge and skills necessary to provide high-quality care for critically ill patients.
2. These outcomes typically cover a range of topics related to critical care, ensuring that nurses are competent in handling patients with complex medical conditions in intensive care units (ICUs) and other critical care settings.
3. The learning outcomes of the basics of anesthesia in critical care encompass a range of knowledge and skills essential for healthcare professionals involved in managing critically ill patients.
4. The learning outcomes of the basics of surgery in critical care include gaining fundamental knowledge and skills required to manage surgical patients in a critical care setting.

Module Number	**Content**	**Total Hours**	**% of questions**	**Bloom Level (applicable)**	**Remarks, if any**
THEORY					
M I	PATIENT CARE	8	20		NA
M II	PATIENT MONITOR AND RELEVANT GADGETS	7	10		NA
M III	BASIC ANESTHESIA	8	10		NA
M IV	GADGETS RELEVANT TO ANAESTHESIA	7	10		NA
M V	BASIC SURGERY	8	10		NA
M VI	POST-SURGERY MANAGEMENT	7	10		NA
Total Theory		45	100		
TUTORIAL		30			
	TOTAL	75			

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Detailed Syllabus

MODULE I: PATIENT CARE [8L]

UNIT 1: Nursing Care of Patients – bed care, mouth care, and back care. Care of a critically ill patient**,** Care of a patient on a ventilator, and Care of a post-operative patient.

UNIT 2: Handwashing, dressing, barrier nursing**,** Consent for various procedures, Communication with patient relatives.

UNIT 3: Cardio Pulmonary Resuscitation, Basic Life Support, Infection Control.

UNIT 4: Airway management, Oxygen Therapy, Self-Protection during assisted breathing**.**

MODULE II: PATIENT MONITORING AND RELEVANT GADGETS [7L]

UNIT 1: Monitoring of critically ill patients, Monitoring of patients in ventilator.

UNIT 2: Ryle's Tube, Foley's Catheter, Laryngoscope, Central Venous Catheter, ET tube, Arterial Canula, ECG, Pacemaker, IV canula and drip sets, IV fluid, Glucometer, Sphygmomanometer.

MODULE III: BASIC ANAESTHESIA [8L]

UNIT 1: GA – premedication, induction of GA, intubation, maintenance of GA.

UNIT 2: Drugs related to GA – induction agents, muscle relaxants, analgesics, sedatives, reversal agents.

UNIT 3: Regional Anaesthesia – spinal/epidural/local block. Local Anaesthesia.

UNIT 4: Monitoring of GA and RA.

MODULE IV: GADGETS RELEVANT TO ANAESTHESIA [7L]

UNIT 1: Anaesthesia equipment – breathing systems, airway equipment (ETT, oral, and nasal airway). Anesthesia machines.

UNIT 2: Fasting guidelines for elective surgery. Consent for surgery and anesthesia**.**

MODULE V: BASIC SURGERY [8L]

UNIT 1: Surgical instruments and their uses, Sutures. Cleaning and Sterilization of instruments.

MODULE VI: POST-SURGERY MANAGEMENT [7L]

UNIT 1: Bleeding and hemostasis, the layout of instruments. Dressing and draping. Various Positions. Counting of instruments. Different abdominal incisions.

Suggested Books:

1. Jaya Curuvilla: Essentials of Critical Care Nursing
2. Anshul Jain: Essentials of Anesthesia and Critical Care

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Course Name: FUNDAMENTALS OF BIOCHEMISTRY

Mode: Offline

Credits: 5 (3T+2P)

BMICCT 202 & 292

Aim of the course:

The aim is to achieve knowledge of biochemistry and its features as a whole.

Course Objective:

1. It aims to provide students with a foundational understanding of the essential principles, concepts, and techniques in the field of biochemistry.
2. This introductory course serves as a basis for more advanced studies in biochemistry, molecular biology, and related disciplines.
3. It introduces students to the fundamental concepts of biochemistry, including the structure and function of biomolecules (proteins, nucleic acids, lipids, and carbohydrates).
4. It explores the pathways and regulation of cellular metabolism, including glycolysis, the citric acid cycle, and oxidative phosphorylation

Sr no.	Graduate attributes	Mapped Modules
CO 1	Ability to comprehend the basic principles of biochemistry	MODULE I
CO 2	Ability to comprehend basics of Carbohydrates	MODULE II
CO 3	Ability to comprehend Lipids	MODULE III
CO 4	Ability to comprehend basics of Nucleic Acid and Protein	MODULE IV
CO 5	Ability to comprehend enzymes and their clinical application	MODULE V
CO 6	Ability to comprehend Vitamins and Minerals	MODULE VI
CO 7	Ability to comprehend the Acid Base balance	MODULE VII

Learning objectives:

1. It aims to provide students with a foundational understanding of the chemical processes that occur within living organisms.
2. Biochemistry is a branch of science that explores the molecular basis of life, and it plays a critical role in various fields, including medicine, genetics, pharmacology, and biotechnology.
3. Learn about the structure, function, and properties of essential biomolecules, including carbohydrates, lipids, proteins, and nucleic acids.

4. Explore the major metabolic pathways in cells, such as glycolysis, citric acid cycle (Krebs cycle), oxidative phosphorylation, and gluconeogenesis.
5. Learn about the processes of transcription (DNA to RNA) and translation (RNA to protein) and their regulation.

Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks, if any
THEORY					
M I	INTRODUCTION TO BIOCHEMISTRY	6	15		NA
M II	CARBOHYDRATES	6	15		NA
M III	LIPIDS	7	20		NA
M IV	NUCLEIC ACIDS AND PROTEINS	7	20		NA
M V	ENZYMES	7	10		NA
M VI	VITAMINS AND MINERALS	6	10		NA
M VII	ACID BASE BALANCE	6	10		NA
Total Theory		45	100		
PRACTICAL		30			
	TOTAL	75			

Detailed syllabus:

MODULE I: INTRODUCTION TO BIOCHEMISTRY [6L]

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson – Hasselbalch equation, physiological buffers in living systems, Energy in living organism. Properties of water and their applications in biological systems. Introduction to Biomolecules, Biological membrane, Clinical application of Electrolytes and radioisotopes.

MODULE II: CARBOHYDRATES [6L]

Classification of carbohydrates – mono, di, oligo, and polysaccharides. Structure, physical and

chemical properties of carbohydrates Isomerism, racemization and mutarotation. Digestion and absorption of carbohydrates. Metabolic pathways and bioenergetics – Glycolysis, glycogenesis, glycogenolysis, and its hormonal regulation. TCA cycle and electron transport chain. Oxidative phosphorylation. Biochemical aspect of Diabetes mellitus and Glycogen storage Disease.

MODULE III: LIPIDS [7L]

Classification of lipids- simple, compound, and derived lipids. Nomenclature of fatty acid, physical and chemical properties of fat, Metabolic pathways: synthesis and degradation of fatty acid (beta-oxidation, hormonal regulation of fatty acid metabolism, ketogenesis, Biosynthesis of Cholesterol. Disorders of lipid metabolism.

MODULE IV: NUCLEIC ACID AND PROTEIN [7L]

The structure of purines and pyrimidines, nucleoside, nucleotide, and DNA act as genetic material, and chargeoffs rule. Watson and Crick model of DNA. Structure of RNA and its type. Metabolism and Disorder of Purines and pyrimidines nucleotide Classification, structure and properties of proteins, structural organization of proteins, classification and properties of amino acids. Separation of protein, Inborn Metabolic error of amino acid metabolism.

MODULE V: ENZYMES AND THEIR CLINICAL APPLICATION [7L]

Classification of enzymes, apoenzyme, coenzyme, holoenzyme and cofactors. Kinetics of enzymes –Michaelis-Menten equation. Factors affecting enzymatic activity: temperature, pH, substrate concentration, and enzyme concentration. Inhibitors of enzyme action: Competitive, non-competitive, irreversible. Enzyme: Mode of action, allosteric and covalent regulation. Clinical enzymology. Measurement of enzyme activity and interpretation of units.

MODULE VI: VITAMINS AND MINERALS [6L]

Fats soluble vitamins (A, D, E, K), Water soluble vitamins (B complex vitamin), Principle elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium), Trace elements: Calorific value of foods –Basal metabolic rate (BMR)- Respiratory quotient (RQ), Specific dynamic action (SDA), Balanced diet, Nutrition Marasmus, Kwashiorkor: Assessment of nutrition requirements & Basic nutritional plane, Normal requirements of calories, proteins, fluid, electrolytes, Fluid balance, and electrolytes

MODULE VII: ACIDS BASE BALANCE [6L]

Definition, PH values, Henderson – Hasselbach equation, Buffers, Indicators, Normality, Molarity, and Molality

PRACTICALS [30P]

- Benedict's test
- Heat coagulation tests.
- Demonstration of glass and plastic apparatus and equipment (Colorimeter,
- spectrophotometer, Water distillation plant, pH meter) used in the Biochemistry Lab.
- Handling and cleaning of the apparatus and equipment.
- Preparation of different percentage, normal, and molar solutions.
- Preparation of solution by dilution.
- Preparation of different buffers used in the pathological laboratory and determining their PH.

Suggested Readings:

1. U. Sathyanarayana: Essentials of biochemistry. Books & Allied Publications (2013)

2. Ambika Shanmugam: Fundamentals of Biochemistry. Lippincott India (2013)

3. A. C. Deb: Fundamentals of Biochemistry (2001)

4. Murray: Harper's biochemistry. Mac-Graw Hill (2012)

5. Ferrier: Lipincott's Biochemistry. LWW(2013)