

CHOICE BASED CREDIT SYSTEM

140 CREDITS FOR 3YEARS UG
DEGREE

MAKAUT FRAMEWORK
W.E.F.AY2021-2022

MODEL
CURRICULUM FOR
**B.SC.(MEDICAL INSTRUMENTATION &
CRITICAL CARE TECHNOLOGY)**

**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

**B.SC. (MEDICAL INSTRUMENTATION &
CRITICAL CARE TECHNOLOGY)**

Objective:

This course is designed to help healthcare professionals comprehend issues related to providing critical care to patients requiring the same along with having a full proof knowledge on maintenance of various biomedical instruments required for conducting medical tests and other related ailments. The course also aims to comprehend Healthcare organizations.

Course:

- Three- Year full-time B.Sc. In Medical Instrumentation & Critical Care Technology course (Six-Semester).
- Minimum number of class room contact teaching for B.Sc. in Medical Instrumentation & Critical Care Technology programme should be 128Credits (one credit equals 10hours) and Two Internship/Project should be 06credits each i.e., Total 128+12=140 credits.
- Specialization: Students can opt for any one functional specialization from **Cardiovascular Technology, Imaging Technology, Medical Laboratory Technology and Renal Replacement Therapy & Dialysis Technology.**
- As per UGC guidelines, a student can opt for Honors in a specific stream for which he/she needs to acquire 140 credit points along with additional 20 credit points that can be accrued by undertaking online courses as prescribed by the university under MOOCs basket.

Eligibility Criteria:

In order to be eligible for admission to B.Sc. Medical Instrumentation & Critical Care Technology program a student must hold a 10+2 or equivalent degree from a recognized board of education with English as compulsory subject.

Course Structure:

Subject Type	Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
CC	C1,C2	C3,C4	C5,C6,C7	C8,C9,C10	C11,C12	C13,C14
DSE					DSE1,DSE2	DSE3,DSE4
GE	GE1	GE2	GE3	GE4	Capstone Project Evaluation	
AECC	AECC1	AECC2				
SEC			SEC1	SEC2		
	4(20)	4(20)	5(26)	5(26)	4(24)	4(24)

B.SC. MEDICAL INSTRUMENTATION AND CRITICAL CARE TECHNOLOGY

Sl. No.	Program Outcome	Courses
1	Comprehending the basic principles of Human Anatomy and Physiology	C1, C2, C5, C6
2	Illustrating the concept of Biochemistry, Pathology and Pharmacology	C3, C4, C10
3	Demonstrating the application of ICU Therapy and Procedures for Critical Care	C9, C11, SEC2
4	Comprehending the functions and maintenance of medical instruments	C7, C8, C13
5	Analyzing the importance of Cardiovascular Technology, Imaging Technology, Medical Lab Technology and Dialysis Technology	DSE1, DSE 3
6	Comprehending Health Economics, Principles of Management & Organizational Behavior, Basics of Finance & Accounting	GE1, GE2, GE3
7	Demonstrating the importance of Health Education & Communication and Support Services in Hospital	GE5, GE6
8	Illustrating Entrepreneurial Issues, Environmental concerns & Ethical practices in Critical Care	GE4, AECC1, SEC1
9	Comprehending Business Communication	AECC2
10	Determining Cellular and Radiation Biophysics	C12, C14
11	Demonstrating the application of Cardiovascular Technology, Imaging Technology, Medical Lab Technology and Dialysis Technology	DSE2, DSE4
12	Determining Bio Medical Waste Management and comprehending basics of Bio Statistics	GE7, GE8

COURSE STRUCTURE

BMICCT - SEMESTER I

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C1	Basic Anatomy	BMICCT 101	4	0	0	6
		BMICCT 191	0	0	2	
C2	Basics of Physiology	BMICCT 102	4	0	0	6
		BMICCT 192	0	0	2	
GE1	Any ONE from the list of Generic Elective Basket		5	1	0	6
AECC1	Environmental Studies	BMICCT 104	2	0	0	2
TOTAL						20

BMICCT - SEMESTER II

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C3	Fundamentals of Biochemistry	BMICCT 201	4	0	0	6
		BMICCT 291	0	0	2	
C4	Essentials of Pathology	BMICCT 202	5	1	0	6
GE2	Any ONE from the list of Generic Elective Basket		5	1	0	6
AECC2	English Communication & Language Lab	BMICCT 204	2	0	0	2
TOTAL						20

BMICCT - SEMESTER III

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C5	Applied Anatomy related to Critical Care	BMICCT 301	5	1	0	6
C6	Applied Physiology related to Critical Care	BMICCT 302	5	1	0	6
C7	Fundamentals of Electricals & Electronics	BMICCT 303	4	0	0	6
		BMICCT 391	0	0	2	
GE3	Any ONE from the list of Generic Elective Basket		5	1	0	6
SEC 1	Ethical Standards in Critical Care Technology	BMICCT 305	2	0	0	2
TOTAL						26

BMICCT - SEMESTER IV

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C8	Biomedical Instrumentation	BMICCT 401	5	1	0	6
C9	ICU Therapy	BMICCT 402	4	0	0	6
		BMICCT 492	0	0	2	
C10	Clinical Pharmacology	BMICCT 403	5	1	0	6
GE4	Any ONE from the list of Generic Elective Basket		5	1	0	6
SEC 2	Procedural Skills in Critical Care	BMICCT 405	2	0	0	2
TOTAL						26

BMICCT - SEMESTER V

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C11	CSSD Procedures	BMICCT 501	4	0	0	6
		BMICCT 591	0	0	2	
C12	Cellular Biophysics	BMICCT 502	4	0	0	6
		BMICCT 592	0	0	2	
DSE 1	Elective-I (Any one paper from ONE specialization)	BMICCT 503 A/B/C/D	4	0	0	6
		BMICCT 593A/B/C/D	0	0	2	
DSE 2	Minor Project	BMICCT 584	0	0	6	6
TOTAL						24

BMICCT - SEMESTER VI

SUBJECTS	SUBJECT NAME	COURSE CODE	CREDIT POINTS			TOTAL CREDITS
			L	T	P	
C13	Equipment Maintenance & Troubleshooting	BMICCT 601	5	1	0	6
C14	Radiation Biophysics	BMICCT 602	4	0	0	6
		BMICCT 691	0	0	2	
DSE 3	Elective-II (Any one paper from ONE specialization)	BMICCT 603 A/B/C/D	4	0	0	6
		BMICCT 693A/B/C/D	0	0	2	
DSE 4	Major Project	BMICCT 684	0	0	6	6
TOTAL						24

*Project/Internship in lieu of one of the elective core discipline papers.

LIST OF SKILL ENHANCEMENT COURSES (SEC):

SEC 1: Ethical Standards in Critical Care Technology

SEC 2: Procedural Skills in Critical Care

LIST OF ABILITY ENHANCEMENT COURSES (AECC):

AECC 1: Environmental Studies

AECC 2: English Communication & Language Lab

DISCIPLINE SPECIFIC ELECTIVES: (DSE)

DSE 1: Cardiovascular Technology

DSE 3: Renal Replacement Therapy & Dialysis Technology

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

DSE 1 [CARDIO VASCULAR TECHNOLOGY]	DSE 3 [RENAL REPLACEMENT THERAPY & DIALYSIS TECHNOLOGY]
Cardiac Anatomy and Physiology (BMICCT 503A & 593A)	Concepts of Renal Diseases (BMICCT 603A & 693A)
Cardio VascularTechnology – Clinical (BMICCT 503B & 593B)	Renal DiseaseTherapeutics (BMICCT 603B & 693B)
Cardiac Pathologyand Pharmacology (BMICCT 503C & 593C)	Dialysis Technology (BMICCT 603C & 693C)
Cardio vascularTechnology – Applied (BMICCT 503D & 593D)	Pharmacologyrelated to Hemo and Peritoneal Dialysis (BMICCT 603D & 693D)

SEMESTER I

C1: BASIC ANA TOMY (BMICCT 101)

Course Objectives:

1. Demonstrate the anatomical terms, organization of human body and structure of cell, tissue, membranes and glands.
2. Demonstrate the structure and functions of bones and joints.
3. Demonstrate the structure and functions of respiratory system.
4. Demonstrate the structure and functions of cardio vascular system.
5. Demonstrate the structure and functions of central nervous system.
6. Demonstrate the structure and functions of the abdomen

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to gain an comprehending of organization of human body and structure of cell, tissue, membranes and glands.	Module I
2	Ability to demonstrate structure and functions of bones and joints.	Module II
3	Ability to demonstrate the structure and functions of respiratory system	Module III
4	Ability to comprehend the structure and functions of cardio vascular system	Module IV
5	Ability to demonstrate the structure and functions of central nervous system	Module V
6	Ability to comprehend the structure and functions of the abdomen	Module VI

MODULE I: INTRODUCTION TO HUMAN ANATOMY

[10L]

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

[10L]

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

[10L]

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 bronchial tree, Lungs with broncho-pulmonary segments and surface anatomy, Bronchial circulation, nerve supply

MODULE IV: CARDIOVASCULAR SYSTEM [4L]

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 [6L]

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 [4L]

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 [10P]

I. Osteology

II. Surface Anatomy

III. Radiology

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. Chaurasia: Human Anatomy CBS Publishers (2012)
5. Standring: Gray's Anatomy Penguin Books Ltd (2008)

ModuleNo.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	INTRODUCTION TO HUMAN ANATOMY	10	15	1	1		
MODULE II	MUSCULOSKELETAL SYSTEM	10	15	2	1		
MODULE III	RESPIRATORY SYSTEM	10	15	3	1		
MODULE IV	CARDIOVASCULAR SYSTEM	4	5	4	1		
MODULE V	CENTRAL NERVOUS SYSTEM	6	10	5	1		
MODULE VI	EXCRETORY SYSTEM	4	10				
MODULE VII	ABDOMEN	6	10	6	1		
MODULE VIII	PRACTICAL APPLICATION	10	20	7	1		

C2: BASICS OF PHYSIOLOGY (BMICCT 102)

Course Objectives:

1. Demonstrate the physiology of cell, tissues, membranes and glands.
2. Demonstrate the physiology of blood and functions of 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 excretory system
8. Demonstrate the functions of Endocrine System
9. Define the basics of the Reproductive System

Course Outcome (CO)

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend physiology of cell, tissues, membranes and glands	Module I
2	Ability to demonstrate physiology and functions of heart	Module II
3	Ability to determine blood cell count, coagulation, grouping, Hb; BP and Pulse monitoring	Module III
4	Ability to comprehend physiology and mechanism of respiration	Module IV
5	Ability to demonstrate spirometry and functions of Central Nervous System	Module V

6	Ability to comprehend physiology and anatomy of Digestive system	Module VI
7	Ability to comprehend physiology of excretory system	Module VII
8	Ability to comprehend the functions of Endocrine System	Module VIII
9	Ability to comprehend the basics of Reproductive System	Module IX

MODULE I: THE CELL

[4L]

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

[6L]

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

[6L]

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, WBC's, platelets

Unit 4: Functions of haemoglobin

Unit 5: Erythrocyte sedimentation rate

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

Unit 7: Platelets: Formation, normal level and functions

Unit 8: Blood group and Rh factor

MODULE IV: RESPIRATORY SYSTEM

[6L]

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 [8L]
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 [6L]
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 [4L]
Unit 1: Normal urinary output, Micturition
Unit 2: Renal function tests, renal disorders

MODULE VIII: ENDOCRINE SYSTEM [6L]
Unit 1: Function of pituitary
Unit 2: Thyroid
Unit 3: Parathyroid Hormones
Unit 4: Adrenal / Pancreatic

MODULE IX: REPRODUCTIVE SYSTEM [4L]
Unit 1: Formation of semen & spermatogenesis
Unit 2: Brief account of menstrual cycle

PRACTICALS IN PHYSIOLOGY [10P]
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 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).

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	THE CELL	4	10	1	1		
MODULE II	CARDIOVASCULAR SYSTEM	6	10	2	1		
MODULE III	BLOOD	6	10	3	1		
MODULE IV	RESPITORY SYSTEM	6	10	4	1		
MODULE V	CENTRAL NERVOUS SYSTEM	8	10	5	1		
MODULE VI	DIGESTIVE SYSTEM	6	10	6	1		
MODULE VII	EXCRETORY SYSTEM	4	5	7	1		
MODULE VIII	ENDOCRINE SYSTEM	6	10	8	1		
MODULE IX	REPRODUCTIVE SYSTEM	4	5	9	1		
MODULE X	PRACTICAL IN PHYSIOLOGY	10	20	10	1		

AECC 1: ENVIRONMENTAL STUDIES (BMICCT 104)

Course Objectives:

1. To comprehend the concept of Environment and sustainable development
2. To comprehend the concept of ecology and eco system
3. To comprehend the different types of natural resources – renewable and non-renewable
4. To comprehend the concept of biodiversity and conservation of resources
5. To comprehend the reasons behind environmental pollution – its effects and control measures
6. To comprehend environmental laws, policies and acts.
7. To comprehend the impact of environment on human health and different types of disasters.

Course Outcomes: (CO)

Sl. No.	Course Outcome	Mapped Modules
1	Ability to gain an comprehending of the environment	Module I – Unit 1
2	Ability to define ecology and eco system	Module I – Unit 2
3	Ability to determine renewable and non-renewable natural resources	Module I – Unit 3

4	Ability to comprehend biodiversity and its relationship with natural resources	Module II – Unit 4
5	Ability to determine the reasons behind environmental pollution and means of controlling the same.	Module II – Unit 5
6	Ability to comprehend the different environmental laws	Module II – Unit 6
7	Ability to comprehend the impact of environment on human health and disaster.	Module II – Unit 7

MODULE I

Unit 1: Introduction to Environmental Studies- Multidisciplinary nature of environmental studies, Scope and importance; Concept of sustainability and sustainable development. [2L]

Unit 2: Ecology and Ecosystems- Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, wetlands, rivers, oceans, estuaries) [4L]

Unit 3: Natural Resources- Concept of Renewable and Non-renewable resources, Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes, consequences and remedial measures, Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Environmental impacts of energy generation use of alternative and nonconventional energy sources, growing energy needs. [4L]

MODULE II

Unit 4: Biodiversity and Conservation- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation [2L]

Unit 5: Environmental pollution: concepts and types, Air, water, soil, noise and marine pollution-causes, effects and controls, Concept of hazards waste and human health risks, Solid waste management: Control measures of Municipal, biomedical and e-waste of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value [2L]

Unit 6: Environment Laws: Wildlife Protection Act; Forest Conservation Act. Water (Prevention and control of Pollution) Act; Air (Prevention & Control of Pollution) Act; Environment Protection Act; Biodiversity Act. International agreements: Montreal Protocol, Kyoto protocol and climate negotiations; Convention on Biological Diversity (CBD). Protected area network, tribal populations and rights, and human wildlife conflicts in Indian context. [2L]

Unit 7: Human Communities and the Environment- Human population growth: Impacts on environment, human health and welfare, Environmental Disaster: Natural Disasters-floods, earthquake, cyclones, tsunami and landslides; Manmade Disaster- Bhopal and Chernobyl. Environmental movements: Bishnois, Chipko, Silent valley, Big dam movements. [4L]

Suggested Readings:

1. Text Book of Environmental Studies - Asthana, D. K. (2006). S. Chand Publishing
2. Fundamentals of Environmental Studies - Basu, M., Xavier, S. (2016). Cambridge University Press, India
3. Textbook of Environmental Studies for Undergraduate Courses - Bharucha, E. (2013), Universities Press
4. Environmental Chemistry, 6th Edition - De, A.K., (2006), New Age International, New Delhi

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (Ifapplicable)	Remarks (If any)
MODULE I UNIT1	INTRODUCTION TO ENVIRONMENTAL STUDIES	2	10	1	8		
MODULE I UNIT2	ECOLOGYAND ECOSYSTEMS	4	20	2	8		
MODULE I UNIT3	NATURALRESOURCES	4	20	3	8		
MODULE II UNIT4	BIODIVERSITYAND CONSERVATION	2	10	4	8		
MODULE II UNIT5	ENVIRONMENTAL POLLUTION	2	10	5	8		
MODULE II UNIT6	ENVIRONMENT LAWS	2	10	6	8		
MODULE II UNIT7	HUMAN COMMUNITIES AND THE ENVIRONMENT	4	20	7	8		

SEMESTER II

C3: FUNDAMENTALS OF BIOCHEMISTRY (BMICCT 201)

Course Objectives:

1. To gain comprehension of the basic principles of biochemistry.
2. To comprehend the basics of Carbohydrates
3. To gain an comprehending of Lipids
4. To comprehend basics of Nucleic Acid and Protein
5. To comprehend enzymes and their clinical application
6. To comprehend Vitamins and Minerals
7. To comprehend the Acid Base balance

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend the basic principles of biochemistry	Module I
2	Ability to comprehend basics of Carbohydrates	Module II
3	Ability to comprehend Lipids	Module III
4	Ability to comprehend basics of Nucleic Acid and Protein	Module IV
5	Ability to comprehend enzymes and their clinical application	Module V
6	Ability to comprehend Vitamins and Minerals	Module VI
7	Ability to comprehend the Acid Base balance	Module VII

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

[8L]

Classification of carbohydrates – mono, di, oligo and polysaccharides. Structure, physical and chemical properties of carbohydrates Isomerism, racemisation 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

[6L]

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**[8L]**

Structure of purines and pyrimidines, nucleoside, nucleotide, DNA act as a genetic material, Chargoff's 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**[10L]**

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**[8L]**

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**[4L]**

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

PRACTICALS**[10P]**

- Benedict's test
- Heat coagulation tests.

Suggested Readings:

1. U. Sathyanarayana: Essentials of biochemistry. Books & Allied Publications(2013)
2. AmbikaShanmugam: 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: Lippincott's Biochemistry. LWW(2013)

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	INTRODUCTION TO BIOCHEMISTRY	6	5	1	2		
MODULE II	CARBOHYDRATES	8	15	2	2		
MODULE III	LIPIDS	6	5	3	2		
MODULE IV	NUCLEIC ACIDS AND PROTEINS	8	15	4	2		
MODULE V	ENZYMES	10	20	5	2		
MODULE VI	VITAMINS AND MINERALS	8	15	6	2		
MODULE VII	ACID BASE BALANCE	4	5	7	2		
MODULE VIII	PRACTICAL APPLICATION	10	20	8	2		

C4: ESSENTIALS OF PATHOLOGY (BMICCT 202)

Course Objectives:

1. To comprehend the concept of Inflammation
2. To comprehend the pathological aspects of Respiratory system
3. To comprehend the pathological aspects of Cardiovascular system
4. To comprehend the pathological aspects of Central Nervous system
5. To comprehend the concept of Haematology
6. To comprehend pathological aspects of GIT, Liver, Pancreas, Renal, Endocrine
7. To comprehend environmental and nutritional disorders

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to define concept of Inflammation	Module I
2	Ability to comprehend pathological aspects of Respiratory system	Module II
3	Ability to comprehend pathological aspects of Cardiovascular system	Module III
4	Ability to comprehend pathological aspects of Central Nervous system	Module IV
5	Ability to comprehend the concept of Haematology	Module V
6	Ability to comprehend pathological aspects of GIT, Liver, Pancreas, Renal, Endocrine	Module VI
7	Ability to comprehend Environmental disorders	Module VII

MODULE I: INFLAMMATION**[6L]**

Inflammation and healing, Tumors, Immune system

MODULE II: RESPIRATORY SYSTEM**[10L]**

Respiratory failure, Adult respiratory distress syndrome, Pneumonia, TB, Opportunistic infections, Bronchial asthma and COPD, Bronchiectasis and Lung abscess, Atelectasis, collapse, Pleural disease: Pneumothorax, pleural effusion, Occupational lung diseases - Smoke inhalation, Pneumoconiosis

MODULE III: CARDIOVASCULAR SYSTEM**[12L]**

Shock: hypovolemic, cardiogenic, obstructive, septic, Hypertension in ICU, Congestive cardiac failure, acute Left ventricular failure, Rightventricular failure, Pulmonary edema, Pulmonary Hypertension, Pulmonary embolism, Ischemic heart disease

MODULE IV: CENTRAL NERVOUS SYSTEM**[10L]**

Cerebrovascular disease (stroke), Coma, Delirium in ICU, Neuromuscular disease: Myasthenia gravis, Critical illness polyneuropathy, Diaphragmatic paralysis; GuillianBarre syndrome, Brain death, Persistent vegetative state, Trauma: Head injury, unstable spine and protection,

MODULE V: HAEMATOLOGY**[6L]**

Anemia in ICU, Neutropenia, Bleeding disorders, Clotting disorders

MODULE VI: GIT, LIVER, PANCREAS, RENAL, ENDOCRINE**[10L]**

Upper GI bleed, Hepatic coma, Pancreatitis, Renal failure in ICU, Hypoglycemia, Hyperglycemia, Disorders Sodium, Potassium and Fluid balance, Stress response role of Adrenals.

MODULE VII: ENVIRONMENTAL DISORDER**[6L]**

Envenomation – snake bite, scorpion sting, Poisoning – general supportive care, common poisons

Suggested Readings:

1. Smeltzer – Brunner & Suddharth Textbook of Medical Surgical Nursing, 2010, LWW
2. Black – Medical Surgical Nursing, 2009, Elsevier
3. Nettina – Lippincott manual of Nursing Practice, 2009. LWW
4. Lewis – medical Surgical Nursing, 2008, Elsevier
5. Hickey – Neurologic & Neurosurgical Nursing, 2009, LWW

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	INFLAMMATION	6	5	1	2		
MODULE II	RESPIRATORY SYSTEM	10	20	2	2		
MODULE III	CARDIOVASCULAR SYSTEM	12	25	3	2		

MODULE IV	CENTRAL NERVOUS SYSTEM	10	20	4	2		
MODULE V	HAEMATOLOGY	6	5	5	2		
MODULE VI	GIT, LIVER, PANCREAS, RENAL, ENDOCRINE	10	20	6	2		
MODULE VII	ENVIRONMENTAL DISORDER	6	5	7	2		

AECC 2: ENGLISH COMMUNICATION & LANGUAGE LAB (BMICCT 204)

Course Objectives:

1. To comprehend the nature, process and importance of communication.
2. To comprehend the different types of business correspondences and letter writing
3. To determine the basic format, steps and different types of reports
4. To develop English vocabulary and learn the common mistakes
5. To gain comprehension of interview and presentation skills for personal grooming.

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend importance of communication	Module I – Unit 1
2	Ability to comprehend different business correspondences, write letters, notices, circulars and other written communication	Module I – Unit 2
3	Ability to write different types of report	Module I – Unit 3
4	Ability to develop English vocabulary and oral communication	Module II – Unit 4
5	Ability to appear in interviews and deliver effective presentations	Module II – Unit 5

MODULE I

Unit 1: Introduction to Business Communication: Nature, Process and Importance of Communication, Types of Communication (verbal and Non-Verbal), Different forms of Communication. Barriers to Communication [2L]

Unit 2: Business Correspondence and Technical Writing: Letter Writing, presentation, living quotations, Sending quotations, placing orders, inviting tenders, Sales Letters, claim & adjustment letters and social correspondence. Notice writing, advertisement writing, précis writing, essay writing, letter writing (applications), Business letter formats (letters of enquiry, replies and

complaints); Resume writing, covering letter.

[4L]

Unit 3: Report Writing: types of reports, basic format of a report, steps of report writing, process of writing a report.

[2L]

MODULE II

Unit 4: Vocabulary building: One word substitution, synonyms and antonyms, idioms and phrases, Common Errors in English

[2L]

Unit 5: Business language and presentation: Importance of business language, Oral Presentation Importance, Characteristics, Soft Skills – Self introduction, Presentation Plan, Interview skill.

[10L]

Suggested Readings:

1. Technical Communication, M.H. Rizvi, Tata McGraw-Hill
2. Effective Business Communication, Asha Kaul
3. Functional Grammar and Spoken and Written Communication in English, Bikram K. Das, Orient Blackswan
4. Communication Skills, Sanjay Kumar and Pushplata, Oxford Publication

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (If applicable)	Remarks (If any)
MODULE I UNIT 1	INTRODUCTION TO BUSINESS COMMUNICATION	2	10	1	9		
MODULE I UNIT 2	BUSINESS CORRESPONDENCE AND TECHNICAL WRITING	4	40	2	9		
MODULE I UNIT 3	REPORT WRITING	2	20	3	9		
MODULE I UNIT 4	VOCABULARY BUILDING	2	10	4	9		
MODULE I UNIT 5	BUSINESS LANGUAGE AND PRESENTATION	10	20	5	9		

SEMESTER III

C5: APPLIED ANATOMY RELATED TO CRITICAL CARE (BMICCT 301)

Course Objectives:

1. To comprehend the basics of Musculoskeletal system
2. To comprehend the concept of Radiology
3. To comprehend applied anatomy related to respiratory system
4. To comprehend applied anatomy related to cardio vascular system
5. To comprehend applied anatomy related to central nervous system

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend basics of Musculoskeletal system	Module I
2	Ability to comprehend the concept of Radiology	Module II
3	Ability to comprehend applied anatomy related to respiratory system	Module III
4	Ability to comprehend applied anatomy related to cardio vascular system	Module IV
5	Ability to comprehend applied anatomy related to central nervous system	Module V

MODULE I: MUSCULO SKELETAL SYSTEM

[12L]

Movement theory of upper and lower extremities and trunk focusing on legs, joints and muscles
Topographic anatomy concerning the neck, arm, leg and back with a focus on vessels, nerves and muscles/fascia and joints, Topographic anatomy concerning thorax, abdomen and the pelvic region with a focus on the abdominal wall, viscera, vessels and nerves. Applied (clinical) anatomy based on the dissected anatomic relations.

MODULE II: RADIOLOGY

[12L]

Diagnostic medical imaging methods: basic knowledge of methodology and interpretation, Radiological reproduction within thorax, abdomen and the pelvic region, Radiology concerning the musculoskeletal system, Surface anatomy and palpations concerning extremities, thorax, abdomen and the pelvic region.

MODULE III: RESPIRATORY SYSTEM

[12L]

Medical Terminology related to respiratory system, Anatomical terms, planes, relations - Anatomy of the upper respiratory tract, Nose, oral cavity, Pharynx, Larynx - Anatomy of thoracic cage bones, muscles, innervation, Anatomy of the lungs - overview, Pleura, lobes of lung, bronchi, trachea, hilum, bronchial tree, Alveolus, Bronchioles, Blood supply, Lymphatics, Innervation

MODULE IV: CARDIOVASCULAR SYSTEM

[12L]

Overview of CVS: Anatomy of heart - Pericardium, myocardium, endocardium, valves, Anatomy of Vascular system - Major Vessels, Arteries, Veins, Capillaries, Regional Circulation - coronary,

cerebral, splanchnic.

MODULE V: CENTRAL NERVOUS SYSTEM

[12L]

Basic organization of the nervous system - Central, Peripheral, Autonomic, Cerebral blood flow, Pain pathway

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. Chaurasia: Human Anatomy CBS Publishers (2012)
5. Standring: Gray's Anatomy Penguin Books Ltd (2008)

ModuleNo.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	MUSCULO SKELETAL SYSTEM	12	20	1	1		
MODULE II	RADIOLOGY	12	20	2	1		
MODULE III	RESPIRATORY SYSTEM	12	20	3	1		
MODULE IV	CARDIOVASCULAR SYSTEM	12	20	4	1		
MODULE V	CENTRAL NERVOUS SYSTEM	12	20	5	1		

C6: APPLIED PHYSIOLOGY RELATED TO CRITICAL CARE (BMICCT 302)

Course Objectives:

1. To gain an insight into pre-clinical aspects of physiology
2. To gain an insight into clinical aspects of physiology
3. To comprehend the physiology of respiratory system
4. To comprehend the physiology of cardio vascular system
5. To comprehend the physiology of central nervous system

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend pre-clinical aspects of physiology	Module I
2	Ability to comprehend clinical aspects of physiology	Module II
3	Ability to comprehend physiology of respiratory system	Module III

4	Ability to comprehend physiology of cardio vascular system	Module IV
5	Ability to comprehend physiology of central nervous system	Module V

MODULE I: PRE CLINICAL PHYSIOLOGY

[10L]

Physiological chemistry, bio electrics integrated aspects on: Neurophysiology, Circulation, Respiration, Renal physiology, Acid-base regulation, Endocrinology, Exercise physiology, Temperature regulation, Gastro-intestinal tract

MODULE II: CLINICAL PHYSIOLOGY

[12L]

Central circulation - examination methods, Peripheral circulation - examination methods, Lung function examinations, Gas exchange examinations, Isotope examinations, Exercise physiology - exercise tests, Kidney function examinations, Study of the gastrointestinal canal, Clinical Neurophysiology, Anesthesia and intensive care, Burns and hypothermia

MODULE III: RESPIRATORY SYSTEM

[14L]

Physiology of breathing, Homeostasis, Mechanics of Breathing, Muscle action, Regulation of breathing, Lung Volumes & Capacity, Gas exchange & transport- oxygen, carbon dioxide, Diffusion- O₂ Transport and abnormalities- CO₂ Transport and abnormalities, Pressure, Volume, Resistance, Compliance, Ventilation and Perfusion, V/Q ratio, Gas exchange, mechanism of diffusion, Work of breathing, Transport of O₂ and CO₂; factors affecting oxygen transport, Acid - base balance, Pulmonary Function Tests, Arterial Blood Gas, Types of respiratory failure - causes and treatment

MODULE IV: CARDIOVASCULAR SYSTEM

[16L]

Cardiac cycle, Cardiac output - factors affecting cardiac output, Cardiac conducting system, Regulation of rate, basic arrhythmias, Principles of ECG, Normal ECG, Blood pressure, maintenance of normal blood pressure and factors affecting it, systolic, diastolic, pulse pressure, mean, Oxygen delivery, uptake to tissues, Central venous pressure, Cardiac output, Stroke volume contractility, Preload, After load, Interpretation of common haemodynamic parameters, Assessment of hemodynamic parameters, Recognize the following regarding arterial cannulation – Indications, Cannulation sites, Possible complications, Normal pressures and their significance, Pressure wave forms, Significance of respiratory variation in the pressure wave forms. CVP Monitoring – Indications, Factors affecting measurement, Insertion sites, Types of catheters, Correct technique of pressure measurement.

MODULE V: CENTRAL NERVOUS SYSTEM

[8L]

Metabolic requirements of the brain, Consciousness, Coma, Brain injury, Sedation, Brain Death

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).

ModuleNo.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	PRE CLINICAL PHYSIOLOGY	10	20	1	1		
MODULE II	CLINICAL PHYSIOLOGY	12	20	2	1		
MODULE III	RESPIRATORY SYSTEM	14	25	3	1		
MODULE IV	CARDIOVASCULAR SYSTEM	16	30	4	1		
MODULE V	CENTRAL NERVOUS SYSTEM	8	5	5	1		

C7: FUNDAMENTALS OF ELECTRICALS AND ELECTRONICS (BMICCT 303)

Course Objectives:

1. To comprehend the concept of Resistance
2. To comprehend the concept of Capacitance
3. To identify the parameters of electricity power
4. To determine classification of medical equipment
5. To comprehend the care and maintenance of ICU equipment and Troubleshooting

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Comprehend the concept of Resistance	Module I
2	Ability to comprehend the concept of Capacitance	Module II
3	Ability to comprehend the parameters of electricity power	Module III
4	Ability to determine classification of medical equipment	Module IV
5	Ability to comprehend the care and maintenance of ICU equipment and Troubleshooting	Module V

MODULE I: RESISTANCE

[8L]

Symbol, units, colour coding equivalent resistance with 'connection in series and parallel.

MODULE II: CAPACITANCE

[10L]

Symbol, units, series and parallel connection, Inductance and transformers

MODULE III: PARAMETERS OF ELECTRICITY POWER [12L]

Voltage, current frequency, power. Differences between AC and DC - AC and DC power supplies, Phase, neutral and earth - conventional colour coding, Ohms law and Kirchoff's law Electrical Circuits. Earth and grounding - Symbol, importance in patient care. AC and DC power supplies- Phase, neutral and earth - conventional colour coding

MODULE IV: CLASSIFICATION OF MEDICAL EQUIPMENT [8L]

According to type of protection: B C F etc.

According to mode of protection: Class I -III

MODULE V: CARE & MAINTENANCE OF ICU EQUIPMENT & TROUBLESHOOTING [12L]

Mechanical Ventilators & Non-invasive ventilators, Pumps: Infusion, syringe, Monitors: Stand-alone & multi-parameter, Cardiac Output monitors, ECG machine, ABG machine, Defibrillator, Ultrasound machine, Bronchoscope

MODULE VI: PRACTICALS [10L]

- I. Workings of all ICU equipment
- II. Care and maintenance of all ICU equipment
- III. Ability to monitor ventilator parameters
- IV. Ability to assess fluid responsiveness in a patient

Suggested Readings:

1. The ICU Book – Paul L Marino (Lippincott, Williams & Wilkins)
2. Practical Methods for Respiratory Care – Raymond Sibberson (Mosby)
3. Respiratory Physiology – The Essentials | John B West (Williams & Wilkins)
4. Ventilation / Blood Flow & Gas Exchange – John B West (Blackwell Scientific Publications)
5. Techniques in Bedside haemodynamic Monitoring – Elaine Kiess Daily & John Speer Schroeder (Mosby)

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	RESISTANCE	8	17	1	4		
MODULE II	CAPACITANCE	10	10	2	4		
MODULE III	PARAMETRES OF ELRCTRICITY POWER	12	25	3	4		
MODULE IV	CLASSIFICATION OF MEDICAL INSTRUMENTS	8	8	4	4		
MODULE V	CARE, MAINTENANCE & TROUBLE SHOOTING	12	13	5	4		
MODULE VI	PRACTICAL	10	13	6	4		

SEC 1: ETHICAL STANDARDS IN CRITICAL CARE TECHNOLOGY (BMICCT 305)

Course Objectives:

1. Comprehending the basic concept of Medical Ethics
2. Comprehending the systems and procedures of medical ethics
3. Determining the principles of Medical ethics
4. To determine ethical considerations in different critical care techniques
5. Comprehending ethical framework for death and dying

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend basic concept of Medical Ethics	Module I
2	Ability to comprehend systems and procedures of medical ethics	Module II
3	Ability to learn about the principles of Medical ethics	Module III
4	Ability determine ethical considerations in different critical care techniques	Module IV
5	Ability to comprehend ethical framework for death and dying	Module V

MODULE I: INTRODUCTION TO MEDICAL ETHICS:

[4L]

History and general principles of medical ethics, History, Medical ethics/research ethics. Concept and elements of informed consent. Limits of the law. Theory of liability. Duty of disclosure. Quality of consent. Vulnerable Subjects Rightful Authority Competence to consent. Justifications for not obtaining consent

MODULE II: MEDICAL ETHICS SYSTEMS

[2L]

Hippocratic Tradition, Cross Cultural Perspectives in Medical Ethics: Eastern Europe Islam China India Japan, Role of Codes: Rules/Guidelines/Ethics Penalties (US Govt.), Covenants/Contracts

MODULE III: PRINCIPLES OF MEDICAL ETHICS

[4L]

The concepts of health and disease, extraordinary importance, Scope of medicine, Relationship between health and disease, Normativism vs. Non-normativism Proponents, Ethical issues in organ transplantation. Morality of organ transplantation. Determination of death. Supply of organs. Selection of patients -criteria. Allocation of a scarce resource.

MODULE IV: ETHICAL CONSIDERATIONS IN ABORTION, AIDS/HIV INFECTION AND REPRODUCTIVE TECHNOLOGIES: [8L]

Limiting Procreation, Contraception, voluntary sterilization and the duty to Procreate, Abortion: Rights/Privacy Status of the fetus. Constitutional status of abortion Law and morality. Rights of Fathers Rights of Minors Public Funding Medical interventions for fetuses, Naturalness or artificiality of the new technologies. Moral status of the early human embryo. Role of the family - genetic lineage. Role of the government. Artificial Insemination in Vitro Fertilization Surrogate Parenthood Genetic Screening and Testing Gene mapping and sequencing of the human genome. Ethical and public policy issues. Freedom and Coercion Confidentiality and Disclosure Access Benefits and Harm Genetic Engineering Ethical and Public Policy Issues

MODULE V: DEATH AND DYING [2L]

Definition of Death, Ethical framework for life support decisions. The incompetent patient. Controversial moral constraints. Withholdings and withdrawing life support

Suggested Readings:

1. Medical Ethics: A Very Short Introduction (2nd edn), Michael Dunn and Tony Hope, Publisher: Oxford University Press Print Publication Date: Nov 2018Print ISBN-13: 9780198815600
2. "Principles of Biomedical Ethics" by Tom L. Beauchamp and James F. Childress
3. Legal And Ethical Issues For Health Professionals Paperback – Import, 17 December 2014 by George D. Pozga
4. Clinical Ethics: A Practical Approach to Ethical Decisions in Clinical Medicine, Seventh Edition, Book by Albert R. Jonsen, Mark Siegler, and William J. Winslade

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (ifapplicable)	Remarks (If any)
MODULE I	INTRODUCTION TO MEDICAL ETHICS	4	25	1	8		
MODULE II	MEDICAL ETHICS SYSTEM	2	10	2	8		
MODULE III	PRINCIPLES OF MEDICAL ETHICS	4	25	3	8		
MODULE IV	ETHICAL CONSIDERATIONS	8	30	4	8		
MODULE V	DEATH & DYING	2	10	5	8		

SEMESTER IV

C8: BIOMEDICAL INSTRUMENTATION (BMICCT 401)

Course Objectives:

6. To Demonstrate biomedical signals and electrodes
7. To gain an comprehending of Cardiac Assistive devices
8. To comprehend radiological equipment
9. To comprehend ultrasonic and neonatal devices
10. To determine Telemedicine and Safety Measures

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Comprehend the concept of biomedical signals and electrodes	Module I
2	Ability to comprehend Cardiac Assistive devices	Module II
3	Ability to comprehend Radiological equipment	Module III
4	Comprehend ultrasonic and neonatal devices	Module IV
5	Ability to determine Telemedicine and Safety Measures	Module V

MODULE I: BIOMEDICAL SIGNALS & ELECTRODES

[12L]

Sources of biomedical signals, Basic medical instrumentation system, Origin of bioelectric signals - ECG, EEG, EMG. Electrodes for ECG, EEG, EMG, Medical surface electrodes and problems, Microelectrodes. Electrocardiograph-block diagram, ECG leads, Faults and troubleshooting, Phonocardiograph-origin of heart sounds, microphones and amplifiers for PCG, Operating Rooms

MODULE II: ASSISTIVE DEVICES CARDIAC SYSTEM AND MONITORS

[12L]

Cardiac Pacemakers, Heart lung machine. Different types of Oxygenators, Pumps, and Monitoring Process. Hemodialyser- Principle of Hemodialysis, Membranes, Dialysate, Different types of hemodialysers, Wearable Artificial Kidney, Implantable Type. Defibrillators, Implantable defibrillators, Functional electrical stimulator (FES)

MODULE III: RADIOLOGICAL, SURGICAL SCOPY AND DIATHERMY EQUIPMENTS [12L]

Digital radiography, Digital Fluoroscopy, Mammography, Angiography, Bone densitometry, Endoscopy, Laparoscopy Bronchoscopy, Gastroscopy, Physiological effects of HF radiation, Depth of Penetration, Short wave, Ultrasonic and microwave diathermy, Surgical diathermy,

MODULE IV: ULTRASONIC AND NEONATAL INSTRUMENTS

[12L]

Basic principles of Echo technique, display techniques A, B, M modes, Echo cardiograms, Echoencephalogram, Ultrasonic applied as diagnostic tool in ophthalmology, obstetrics and gynecology. Infusion Pumps. Baby incubator, Phototherapy, Radiant warmer - Working principle, block diagram, description, and function of basic blocks,

MODULE V: BIOTELEMETRY, TELEMEDICINE AND SAFETY MEASUREMENTS [12L]

Elements of Biotelemetry system, Design of a biotelemetry system, Implantable Units-Problems, Application of Telemetry in Patient Care. Fundamentals of Telemedicine, Block diagram of Telemedicine, Scope & Benefits and Limitation of Telemedicine. Applications –Teleradiography, Telecardiology, Telesurgery. Electric shock hazards – Gross shock, Effects on human body, Micro and macro electric shock, Leakage current and types, Testing of Biomedical Equipments.

Suggested Readings:

1. Joseph J Carr and John M Brown – Introduction to Biomedical equipment Technology - Pearson Education 4th edition New Delhi 2001.
2. Albert M Cook and Webster J G – Therapeutic medical devices Prentice Hall New York 1982
3. Webster J.G Medical Instrumentation application and design – John Wiley and sons New York 3rd edition 1999
4. Jacobson B and Webster J G Medical and Clinical Engineering – Prentice Hall of India New Delhi 1999
5. Leslie Cromwell , Fred J.Weibell and Erich A.Pfeiffer - Biomedical Instrumentation Prentice Hall New Delhi 2000

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (ifapplicable)	Remarks (If any)
MODULE I	BIOMEDICAL SIGNALS & ELECTRODES	12	20	1	4		
MODULE II	ASSISTIVE DEVICES	12	20	2	4		
MODULE III	RADIOLOGICAL EQUIPMENTS	12	20	3	4		
MODULE IV	ULTRASONIC & NEONATAL INSTRUMENTS	12	20	4	4		
MODULE V	BIOTELEMETRY & SAFETY MEASUREMENTS	12	20	5	4		

C9: ICU THERAPY (BMICCT 402)

Course Objectives:

1. Discuss in detail the concept of Mechanical Ventilation
2. Demonstrate in detail the design features of ventilators, their types, how they work and the various modes of ventilation
3. Demonstrate in detail the care of patient on ventilator and weaning from ventilator.
4. Discuss in detail the Basic and Advanced Life Support.
5. Discuss in detail the care of unconscious patient.

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to comprehend concept of Mechanical Ventilation	Module I
2	Ability to comprehend features of ventilators, their types, how they work and the various modes of ventilation	Module II
3	Ability to comprehend care of patient on ventilator and weaning from ventilator	Module III
4	Ability to comprehend Basic and Advanced Life Support	Module IV
5	Ability to comprehend care of unconscious patient	Module V

MODULE I: MECHANICAL VENTILATION**[10L]**

Mechanics of ventilation, Mechanics of exhalation, Work of breathing, Distribution of ventilation, Efficiency and effectiveness of ventilation, Mechanical Ventilators, Types of ventilators, Modes of Mechanical Ventilation, Oxygenation, Ventilation, Timing – Inspiratory of gas / Expiratory, inspiratory hold, PEEP, POP – OFF, FiO₂, Humidification, Non-Invasive Ventilation, Humidifier types, Trouble shooting and alarms, Weaning and Extubation, Nebulization and MDI, Inhaled drug therapy, Suctioning and chest physiotherapy, Incentive Spirometry, Inspiratory resistance exercises, Care of Patient on Ventilator, Care of the chest tube, Extubation failure

MODULE II: AIRWAY ASSISTANCE**[8L]**

Tracheal intubation (oral, nasal), Cricothyrotomy, Open/percutaneous tracheostomy, Fiberoptic bronchoscopy: FOB Intubation, Therapeutic BAL; Decanulation of tracheostomy

MODULE III: CARDIOVASCULAR SYSTEM**[6L]**

Fluid resuscitation and inotropes, Basic of IABP /ECMO, Pericardiocentesis

MODULE IV: LIFE SUPPORT**[12L]**

Basic life support - AED, Mask ventilation, Chest compression, advanced cardiac life support - Drugs, defibrillation, Trauma life support: A –Airway and cervical spine stabilization; B – Breathing; C –Circulation and hemorrhage control; D –Disability; E –Exposure; Manual in line stabilization, Basic care of surgical wounds and fractures, Burns Assessment: History and physical assessment, Assessment of burns and fluid and electrolyte loss, Etiology classification, Pathophysiology, clinical manifestations, Diagnosis, treatment modalities.

MODULE V: RENAL / ABDOMEN THERAPY**[6L]**

Basics of Renal Replacement Therapy, modes of dialysis, Intra-abdominal pressure, abdominal compartment syndrome

MODULE VI: CENTRAL NERVOUS SYSTEM**[6L]**

Care of Unconscious Patient, Comfort - Skin integrity assessment and care, Physiotherapy – chest & limbs, Nutritional needs & supply; Pain Control, Care of epidural, Patient controlled analgesia

MODULE VII: INFECTION CONTROL**[2L]**

Hand hygiene, Universal precautions

MODULE VIII: PRACTICAL**[10L]**

- II. Clinical rotations in selected Medical and Surgical areas
- III. Patient assignments for patient centered comprehensive care
- IV. Case presentations,
- V. Drug study discussion

Suggested Readings:

1. Egan's Fundamentals of Respiratory Care – Robert L. Wikins, James K Stoller,
2. The ICU Book – Paul L Marino (Lippincott, Williams & Wilkins)
3. Practical Methods for Respiratory Care – Raymond Sibberson (Mosby)
4. Respiratory Physiology – The Essentials I John B West (Williams & Wilkins)
5. Ventilation / Blood Flow & Gas Exchange – John B West (Blackwell Scientific Publications)

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	MECHANICAL VENTILATION	10	20	1	3		
MODULE II	AIRWAY ASSISTANCE	8	10	2	3		
MODULE III	CARDIOVASCULAR SYSTEM	6	6	3	3		
MODULE IV	LIFE SUPPORT	12	25	4	3		
MODULE V	RENAL/ABDOMEN THERAPY	6	6	5	3		
MODULE VI	CENTRAL NERVOUS SYSTEM	6	8	6	3		
MODULE VII	INFECTION CONTROL	2	5	7	3		
MODULE VIII	PRACTICAL	10	20	8	3		

C10: CLINICAL PHARMACOLOGY (BMICCT 403)**Course Objectives:**

1. To comprehend the basic concepts of clinical pharmacology
2. To know how to use drug-specific and patient-specific pharmacokinetic parameters
3. To comprehend the concept of drug metabolism and transport
4. To gain an comprehending of pharmacokinetics and drug therapy
5. To determine the assessment of drug effects

6. To know the major drugs and drug classes currently used in medical practice
7. To comprehend pharmacogenomics and pharmacotherapy

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Comprehend the concept of Pharmacological science	Module I
2	Ability to comprehend the use of drug specific and patient specific pharmacokinetic parameters	Module II
3	Ability to comprehend the use and development of drugs	Module III
4	Ability to comprehend major drugs and drug classes	Module IV
5	Ability to determine the assessment of drug effects	Module V
6	Ability to know the major drugs and drug classes currently used in medical practice	Module VI
7	Ability to comprehend pharmacogenomics and pharmacotherapy	Module VII

MODULE I: INTRODUCTION TO CLINICAL PHARMACOLOGY [4L]

Introduction to Clinical Pharmacology and Therapeutics, Introduction to Pharmacology, Drug Development and Clinical Pharmacology, Practical Pharmacology, Biochemical Mechanisms for Drug Toxicity

MODULE II: PHARMACOKINETICS [10L]

Drug Absorption and Bioavailability, Use of Positron Emission Tomography (PET) in Pharmacokinetics, Compartmental Analysis of Drug Distribution, Non-compartmental vs. Compartmental Approaches to Pharmacokinetic Analysis, Population Pharmacokinetics, Chemical Analysis of Drugs and Metabolites, Pharmacokinetics/Pharmacodynamics of Protein Drugs

MODULE III: DRUG METABOLISM AND TRANSPORT [8L]

Pathways of Drug Metabolism, Drug Transporters in ADME and Drug Action, P-Glycoprotein and Drug Transport Part 1, P-Glycoprotein and Drug Transport Part 2, Membrane Transport, Drug Transport across the Blood Brain Barrier

MODULE IV: PHARMACOKINETICS AND DRUG THERAPY IN SPECIAL POPULATIONS [8L]

Pharmacokinetics in Patients Requiring Renal Replacement Therapy, The Liver and Drugs, Drug Therapy in Pregnant and Nursing Women, Developmental and Pediatric Pharmacology, Drug Therapy in the Geriatric Population, Pharmacokinetics and Obesity

MODULE V: ASSESSMENT OF DRUG EFFECTS [6L]

Biomarkers of Drug Effects, Pharmacodynamic and Pharmacokinetic Modeling of Data, Disease Progression Models, Mould Role of Pharmacodynamics in Drug Development, Immunotherapeutics

MODULE VI: DRUG DISCOVERY AND DEVELOPMENT**[14L]**

Drug Discovery, Quantitative Systems Pharmacology, Computational Methods of Drug Discovery and Design, Combinatorial Drug Screening, Animal Scale Up and First-in-Human Studies, Dose Selection and Optimization in the Adult Population, Drug Development in the Pediatric Population, Drug Formulation and Delivery, Natural Products, T-Cell Therapies: Principles and Practice, Pharmacokinetic and Pharmacodynamic Considerations in the Development of Macromolecules , Design of Clinical Drug Development Programs, FDA Approval Considerations

MODULE VII: PHARMACOGENOMICS AND PHARMACOTHERAPY**[10L]**

Pharmacogenomics, Dose Modifications Based on Pharmacogenetics Research, Pharmacogenomics Testing, Clinical Drug Interactions, Clinical Assessment of Adverse Drug Reactions, Post-Marketing Drug Safety Surveillance, Quality Assurance for Drug Therapy

Suggested Readings:

1. Lippincott Illustrated Reviews: Pharmacology. Ed.7 by Karen Whalen
2. Basic and Clinical Pharmacology, 15e by Bertram G. Katzung; Anthony J. Trevor
3. Goodman and Gilman Manual of Pharmacology and Therapeutics, Second Edition, by RandaHilal-Dandan (Author), Laurence Brunton (Author)
4. Essentials of Medical Pharmacology 7th Edition, by Kd (Author), M.D. Tripathi (Author)

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	INTRO TO CLINICAL PHARMACOLOGY	4	5	1	2		
MODULE II	PHARMACO KINETICS	10	20	2	2		
MODULE III	DRUG METABOLISM & TRANSPORT	8	10	3	2		
MODULE IV	DRUG THERAPY	8	10	4	2		
MODULE V	ASSESSMENT O DRUG EFFECTS	6	10	5	2		
MODULE VI	DRUG DISCOVERY	14	25	6	2		
MODULE VII	PHARMACO GENOMICS & PHARMACO THERAPY	10	20	7	2		

SEC 2: PROCEDURAL SKILLS IN CRITICAL CARE (BMICCT 405)

Course Objectives:

1. To be able to provide emergency life support
2. To be able to address abdominal problems
3. To comprehend the procedures related to nervous system
4. To comprehend the concept of Toxicology
5. To be able to perform analgesia and sedation
6. To be able to deal with hematological disorders
7. To be able to perform perioperative care.

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to provide emergency life support	Module I
2	Ability to address abdominal problems	Module II
3	Ability to comprehend procedures related to nervous system	Module III
4	Ability to comprehend the concept of Toxicology	Module IV
5	Ability to perform analgesia and sedation	Module V
6	Ability to deal with hematological disorders	Module VI
7	Ability to perform perioperative care	Module VII

MODULE I: EMERGENCY LIFE SUPPORT

[4L]

Basic Life Support - Keeping Airway open, Use of Ambu bag and mask ventilation, Cardiac massage, Advanced Life Support, Use of Defibrillator, Emergency Management of Trauma

MODULE II: GASTROINTESTINAL; GENITOURINARY AND OBSTETRIC AND GYNAECOLOGICAL PROBLEMS

[4L]

Assistance in a. Placement of Trans oesophageal devices, b. NG tubes, enteral feeding tubes, Sengstaken-Blackemore tube, c. Maintenance of urinary catheters, d. Placement of hemodialysis catheters, e. Management peritoneal dialysis, f. Management CVVHD

MODULE III: NERVOUS SYSTEM

[4L]

Assisting in: Lumbar puncture, Application of intracranial pressure monitoring device, Application of on-line immobilization (C spine protection), cervical neck collar.

MODULE IV: TOXICOLOGY

[2L]

Gastric lavage

MODULE V: ANALGESIA AND SEDATION

[2L]

Care of Epidural, Patient Controlled Analgesia

MODULE VI: HAEMATOLOGICAL DISORDERS:

[2L]

Assisting in: Exchange Transfusion, Plasmapheresis

MODULE VII: TRAUMA, BURNS, ENVIRONMENTAL INJURIES, PERIOPERATIVE CARE
[2L]

Suggested Readings:

1. Smeltzer – Brunner & Siddhartha Textbook of Medical Surgical Nursing, 2010, LWW
2. Black – Medical Surgical Nursing, 2009, Elsevier
3. Nettina – Lippincott manual of Nursing Practice, 2009. LWW
4. Lewis – medical Surgical Nursing, 2008, Elsevier

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	EMERGENCY LIFE SUPPORT	4	20	1	3		
MODULE II	GASTROINTESTINAL & GYNAECOLOGICAL PROBLEMS	4	20	2	3		
MODULE III	NERVOUS SYSTEM	4	20	3	3		
MODULE IV	TOXICOLOGY	2	10	4	3		
MODULE V	ANALGESIA & SEDATION	2	10	5	3		
MODULE VI	HAEMATOLOGICAL DISORDERS	2	10	6	3		
MODULE VII	PERIOPERATIVE CARE	2	10	7	3		

SEMESTER V

C11: CSSD PROCEDURES (BMICCT 501)

Course Objectives:

1. Determination of activities related to CSSD and its core activities
2. Comprehend decontamination and infection control practices
3. Determine steam sterilization techniques and monitoring techniques
4. Determine procedures for pathology

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to determine the activities of CSSD and its core activities	Module I
2	Ability to comprehend decontamination and infection control practices	Module II
3	Ability to comprehend procedures of sterilization	Module III
4	Ability to comprehend the procedure for pathology	Module IV

MODULE I: ROLE OF CSSD IN HEALTH CARE DELIVERY [14L]

Planning and layout, Infection Control and hygiene, Water Quality and its impact in CSSD process, Surgical Procedures, Surgical Instruments: Criteria for Purchase and Maintenance, Quality Assurance in CSSD, Equipment's Purchase Criteria, Re-Processing of Devices, Engineering aspect for CSSD

MODULE II: DECONTAMINATION [12L]

Surgical Instruments and Procedures, Recommended Practices, Principles of Disinfection Assembly of Surgical Instruments, Packaging Materials - Types and Selection

MODULE III: STERILIZATION [14L]

Preparation and Supplies for Terminal Sterilization, Endoscopes and its Sterilization, Different Methods of Sterilization High Temperature Sterilization – Dry Heat, Scientific Principles, Sterilizer Operation, Basic Trouble Shooting Methods, Recommended Practices for Flash Sterilization

MODULE IV: PATHOLOGY AND ADVANCED LAB MEDICINE INVESTIGATIONS [10L]

Pathology and advanced lab medicine investigations, HAVC system and its impact, Microbiology and its implication with respect to CSSD, Call back system in case of detection of failure

MODULE V: PRACTICAL [10L]

- I. Sterilization procedures
- II. Maintenance of CSSD department
- III. Decontamination of surgical instruments

Suggested Readings:

1. Sterilization Technology for the health Care Facility from AN ASPEN PUBLICATION.

2. Hand book on Operation Theatre & Asepsis Published by Cochin Ophthalmic ClubCOC-CME Series 2, 2013
3. Recommended Guidelines for CSSD 1st Edition Published July 2008, Hospital Sterile Services Association (India)
4. The Guide to Good Manufacturing Practices in National Health Services, Sterile Service Departments ISSM
5. Introduction to Sterilization and Disinfection by Gardner and Peel

ModuleNo.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	ROLE OF CSSD	14	25	1	3		
MODULE II	DECONTAMINATION	12	20	2	3		
MODULE III	STERILIZATION	14	25	3	3		
MODULE IV	PATHOLOGY & ADVANCED LAB INVESTIGATION	10	15	4	3		
MODULE V	PRACTICAL	10	15	5	3		

C12: CELLULAR BIOPHYSICS (BMICCT 502)

Course Objectives:

1. Determination of Cell Organization
2. Comprehend Cell Cycle and growth
3. Demonstrate Cell Differentiation and Cell – to – cell interactions
4. Demonstrate Basics of Cell Signaling

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to determine Cell Organization	Module I
2	Ability to comprehend basics of Cell cycle and growth	Module II
3	Ability to comprehend Cell Differentiation and Cell – to – cell interactions	Module III
4	Ability to demonstrate Basics of Cell Signaling	Module IV

MODULE I: CELL ORGANIZATION

[10L]

Cell as the basic structural unit, Origin & organization of Prokaryotic and Eukaryotic cell, Cell size & shape, Fine structure of Prokaryotic & Eukaryotic cell organization Internal architecture of cells, cell organelles, compartment & assemblies membrane system, Ribosome, Polysomes, Lysosomes & Peroxisomes, Connection between cell & its environment, Extracellular Matrix.

MODULE II: CELL CYCLE & GROWTH**[10L]**

The Cell Cycle, Interphase-G₁,S,G₂,M molecular events at different cell cycle phases, A cytoplasmic clock times, Growth Factors & Control of cell proliferation. Mitosis & Cell division-Molecular mechanism , Events in mitosis, significance of mitosis, Meiosis & Sexual reproduction, Molecular mechanism of meiosis, significance of meiosis.

MODULE III: CELL DIFFERENTIATION & CELL-CELL INTERACTIONS**[12L]**

General characteristics of cell differentiation, Localization of cytoplasmic determinants, Molecular mechanism of cell differentiation, Morphological movements & the shaping of body plans, Cell memory, Concept of positional values. Connection between the cell and its environment, Glycocalyx, Extracellular Matrix, collagen, Elastin, Fibronectin, Lamin, Integrins, Cell Junctions, Desmosomes, Gap junction, connexins, Tight Junctions, Plasmodesmata

MODULE IV: BASICS OF CELL SIGNALING**[8L]**

Cell Signaling, General principle of cell signaling, Paracrine, Autocrine, Endocrine & synaptic signaling, Heat Shock Proteins, G-Protein structure and role in signaling, Intracellular Cyclic AMP, Role Ca⁺⁺ in cell signaling, CAM Kinases, (Calmodulin/Ca⁺⁺ dependent protein kinases), Interaction between cyclic AMP & Ca⁺⁺. Synapse and synaptic vesicles, Role of Methylation in adaptation & bacterial chemotaxis.

MODULE V: PRACTICALS**[20P]**

1. To learn a) use of microscope b) principles of fixation and staining; to familiarize with bright field, phase contrast, fluorescence & polarizing microscopes and micrometry.
2. Microscopic observation of bacteria, microalgae, fungi, lichen and protists; Cell staining – Staining of Plant cell (onion epidermal cell), Animal cell (Squamous epithelial cell), Blood cell, Microbial cells (Bacteria & Yeast).
3. To study cell structure from onion leaf peels; Shape and size of the cell–simple & differential staining
4. Cell division- Examination of various stages of mitosis and meiosis -mitosis (Onion root tip)& Meiosis (Tradescantia flower buds / grasshopper testes)
5. Polytene chromosome (chironomous larvae)
6. Separation of chloroplast & flower pigments by paper chromatography
7. Microbiological Techniques:
 - ❖ Preparation of Media (Media preparation: Nutrient agar and Nutrient broth), Cotton Plugging and Sterilization, Pure culture and maintenance of culture, Dilution and pour plate techniques. Standard plate count, Gram staining, other staining methods
 - ❖ Bacterial growth curve- To raise the culture of E. coli and estimate the culture density by turbidity method. Draw a growth curve from the available data. Determination of generation time
- 4.3 Study of different types of eggs; Study of egg of hen and vital, staining of embryo; Culture of chick embryo fibroblast – Demonstration, Study of frog development, observation of frog embryo different developmental stages; Study of different types of sperms by smear preparation.

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	CELL ORGANIZATION	10	20	1	10		
MODULE II	CELL CYCLE & GROWTH	10	20	2	10		
MODULE III	CELL DIFFERENTIATION & CELL-CELL INTERACTIONS	12	20	3	10		
MODULE IV	BASICS OF CELL SIGNALING	8	15	4	10		
MODULE V	PRACTICALS	20	25	5	10		

DSE I: ANY ONE PAPER FROM ONE ELECTIVE (BMICCT 503 A/B/C/D)

DSE II: MINOR PROJECT ON SPECIALIZED AREA (BMICCT 584)

SEMESTER VI

C13: EQUIPMENT MAINTENANCE & TROUBLESHOOTING (BMICCT 601)

Course Objectives:

1. To determine emergency care and life support skills
2. To comprehend Medical Equipment Technology
3. To comprehend working of basic instruments
4. To comprehend calibration and maintenance of basic instruments
5. To determine equipment and departmental practicum

Course Outcome (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to determine emergency care and life support skills	Module I
2	Ability to comprehend Medical Equipment Technology	Module II
3	Ability to comprehend working of basic instruments	Module III
4	Ability to comprehend calibration and maintenance of basic instruments	Module IV
5	Ability to determine equipment and departmental practicum	Module V

MODULE I: EMERGENCY CARE AND LIFE SUPPORT SKILLS

[12L]

Basics of emergency care and life support skills, a. Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Using an AED (Automated external defibrillator). Managing an emergency including moving a patient, Disaster preparedness and management, Fundamentals of emergency management, Preparedness and risk reduction, Incident command and institutional mechanisms, Resource management

MODULE II: INTRODUCTION TO MEDICAL EQUIPMENT TECHNOLOGY

[12L]

Introduction of medical equipment technology-I: Basic theory of operation, function and clinical application of a range of medical devices, such as infusion pumps, heart monitors, blood pressure monitors, pulse oximeters, suction, devices, and centrifuges

MODULE III: COMPREHENDING THE WORKING OF BASIC EQUIPMENTS

[12L]

Introduction to medical equipment technology- II: testing various medical devices for proper operation, computerized equipment control and record keeping Safety issues related to patients and Biomedical Equipment Technology, Basic theory of operation, function, clinical application and operation testing of a range of medical devices

MODULE IV: CALIBRATION AND MAINTENANCE OF BASIC EQUIPMENTS

[12L]

Safety procedural guidelines - Precautions while handling the radioactive rays, Precautions while handling the high voltage circuits, Securing the equipment and surroundings while repairing the equipment on the spot, Shock and vibrations, maintaining the safety of the patient in the vicinity, Installation, Maintenance and Servicing of Medical Equipment, Maintenance of records:

Maintenance and coding of various types of the log book for the machines in various departments of the hospital.

MODULE V: KNOWLEDGE OF EQUIPMENT AND DEPARTMENTAL PRACTICUM [12L]

Principles of medical device, Clinical use and principle of operation of different types and models, Hands-on experience in installation, set-up, operation, routine maintenance, internal components and functional verification testing, Demonstration of Cleaning and safety measures, Features and Setup of equipment's and its routine use to hospital staff, Information to hospital staff about use of equipment - Risk Factor associated with the use of equipment - Complexity - Manufacturer's instruction and specification - Effective use of instruments, Demonstration of documentation and recording of equipment to hospital staff - Reading of instrument/equipment, Recording, Record maintenance

Suggested Readings:

6. Qualifications pack - occupational standards for allied healthcare, Medical Equipment Technology, Health sector skills council
7. Diploma for biomedical courses, Sri Ramachandra University
8. Curriculum Documents for Medical Electronics, Maharashtra State Board of Technical Education, Mumbai
9. WHO's Medical Equipment maintenance programme:
<http://apps.who.int/medicinedocs/documents/s21566en/s21566en.pdf>

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	EMERGENCY CARE & LIFE SUPPORT SKILL	12	20	1	4		
MODULE II	MEDICAL EQUIPMENT TECHNOLOGY	12	20	2	4		
MODULE III	WORKING OF BASIC EQUIPMENT	12	20	3	4		
MODULE IV	CALIBRATION & MAINTENANCE OF BASIC EQUIPMENT	12	20	4	4		
MODULE V	KNOWLEDGE OF EQUIPMENT & DEPARTMENTAL PRACTICUM	12	20	5	4		

C14: RADIATION BIOPHYSICS (BMICCT 602)

Course Objectives:

1. Determination of Basics of Radiation Physics
2. Comprehend Basics of Radiochemistry and Radiobiology
3. Demonstrate Radiation detection and measurement
4. Demonstrate Radiation Safety measures and applications
5. Determine Basic Electrophysiology

Course Outcomes (CO):

Sl. No.	Course Outcome	Mapped Modules
1	Ability to determine basics of Radiation Physics	Module I
2	Ability to comprehend basics of Radiochemistry and Radiobiology	Module II
3	Ability to comprehend Radiation detection and measurement	Module III
4	Ability to demonstrate Radiation Safety measures and applications	Module IV
5	Ability to determine Basic Electrophysiology	Module V

MODULE I: BASICS OF RADIATION PHYSICS

[10L]

Atomic structure models, Constituents of atomic nuclei, Isotopes, Isobars, Isotones, Isomers, Radioactivity, law of Radioactivity, General properties of alpha, beta and gamma radiations, Radiation units: Units of measurement of radioactivity. Curie, Becquerel. Units of exposure, Roentgen, units of measurement of absorbed dose Rad, Gray, relative biological effectiveness, Dose equivalent, Interaction of radiation with matter: Excitation and ionization, Photo electric effect, Compton Effect, pair production, Characteristic radiation. Properties, Characteristics X-rays, Nonionizing radiations-UV, IR, Microwaves & Radio waves, their characteristics, interactions & implications in bio systems.

MODULE II: BASICS OF RADIOCHEMISTRY & RADIOBIOLOGY

[8L]

Radiolysis of water, Production of free radicals & their interactions, Direct and indirect effects of radiation. Radiation chemical yield and G value, Target theory, Single hit & Multi hit theory, Effect of radiation on Nucleic acids, Proteins, Enzymes, Action of radiation on living system – Viruses, Prokaryotic & Eukaryotic cells Cellular effects of radiation, somatic & genetic effects, Inhibition of Mitosis, survival curves, concept of LD 50 , acute and chronic (whole body) effects of radiation, Radiation syndrome in human beings

MODULE III: INTRODUCTION TO RADIATION DETECTION & MEASUREMENT [6L]

Radiation sources, Tele-gamma Unit (Cobalt unit), Gamma chamber, Particle Accelerators, Nuclear reactors, gamma camera, Principles of radiation detection and measurement, General principles of Dosimeters., Basic principle, design and utility of ionization chamber, proportional counter, GM counter, Scintillation Detectors. Thermo-luminescent dosimeter, chemical dosimeter-Fricke, Free radical dosimeters

MODULE IV: RADIATION SAFETY MEASURES AND APPLICATION [8L]

Natural & Man-made radiation exposures, Basic Principles of Radiation protection concept of Maximum permissible dose (MPD) personal & area monitoring, licensing & other administrative procedures for procurement of Radioisotopes, legal aspect of radiation protection, Disposal of radioactive waste. Radioisotopes in biology, Medicine(Therapy & diagnosis),Agriculture, Plant breeding, Soil plant relationship & plant physiology, Biological applications of radioisotope, Radio-labeling & Tracer techniques, Food irradiation, radiation sterilization of medical product, Autoradiography-Principle procedure and Application of autoradiography.

MODULE V: BASIC ELECTROPHYSIOLOGY [8L]

Nature of bioelectric signal, Fundamental concepts in bioelectricity & bioelectronics, principles & utility of patch-clamp, ELECTROCARDIOGRAPHY (ECG) Fundamental principles of electrocardiography, Cardiac electrical field generation during activation , Electrocardiograph lead systems, The normal P wave, Atrial repolarisation, Atrio-ventricular node conduction and the PR segment, Ventricular activation and the QRS complex ,Ventricular recovery and ST-T wave U wave, Normal variants ,Rate and rhythm Principle, instrument design and medical utility : EEG, EMG, ERG, EOG ,Visual evoked potentials, biological impedance and its significance.

MODULE VI: PRACTICAL [20P]

1. To calibrate the UV source using Potassium ferrioxalate actinometry.
2. To measure the UV intensity using UV meter
3. To study the effect of UV, X-rays on mitotic cell division.
4. To study the effect of UV,X-rays on biomolecules – amino acids, proteins
5. , Nucleic acids, enzymes.
6. To study the effect of UV, X-rays on seed germination and study cytogenetic changes
7. To study the effect of UV, X-rays on cell membrane- RBC
8. To study the effect of UV, X-rays on bacterial cell growth and evaluate LD50
9. To investigate background radiation, learn how to measure it, and compensate for it.
10. To study the characteristics of a Geiger-Muller counter and to determine plateau and operating voltage of the GM counter.
11. To determine the resolving time of a GM counter.
12. To estimate the efficiency of the Geiger-Mueller tube for a particular source.
13. To demonstrate the Statistical Nature of Radiation Counting & investigate the statistics related to measurements with a Geiger counter.
14. To investigate the relationship between the distance and intensity of radiation and verify the inverse square relationship between the distance and intensity of radiation.
15. To investigate the relationship between absorber material (atomic number) and backscattering and study the relationship between absorber thickness and backscattering.

Suggested Readings:

1. Primer in Applied Radiation Physics: F.A. Smith.
2. Introduction to Experimental Nuclear Physics: R.M. Singru.
3. Radiation Biophysics: E.L. Alpen.
4. Atom, Radiation and Radiation Protection: J. Turner.

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	BASICS OF RADIATION PHYSICS	10	15	1	10		
MODULE II	BASICS OF RADIOCHEMISTRY & RADIOBIOLOGY	8	15	2	10		
MODULE III	INTRODUCTION TO RADIATION DETECTION & MEASUREMENT	6	10	3	10		
MODULE IV	RADIATION SAFETY MEASURES AND APPLICATION	8	15	4	10		
MODULE V	BASIC ELECTROPHYSIOLOGY	8	15	5	10		
MODULE VI	PRACTICAL	20	20	6	10		

**DSE III: ANY ONE PAPER FROM SAME ELECTIVE AS DSE I
(BMICCT 603 A/B/C/D)**

DSE IV: MAJOR PROJECT ON SPECIALIZED AREA (BMICCT 684)

DISCIPLINE SPECIFIC ELECTIVES (DSE)

DSE 1: CARDIO VASCULAR TECHNOLOGY

ELECTIVE I: CARDIAC ANATOMY & CARDIAC PHYSIOLOGY

Course Objectives:

1. To demonstrate Cardiac Anatomy.
2. To demonstrate Cardiac physiology.
3. To demonstrate conduction system of heart
4. To demonstrate heart chambers
5. To demonstrate details about cardiac perfusion

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear demonstrating of Cardiac anatomy	Module I
2	Students will be able to demonstrate Cardiac physiology.	Module II
3	Students will be able to demonstrate the concept and hemodynamics of the heart	Module III
4	Students will be able to demonstrate about the chambers of heart	Module IV
5	Students will be able to demonstrate about cardiac perfusion	Module V

MODULE I: CARDIAC ANATOMY

[16L]

Anatomy of Heart: Surface anatomy, Gross anatomy, cardiac chambers, septa, valves, Pericardium, Arteries, Veins, Lymphatics, Aorta and branches, Venous drainage, Pulmonary vessels and circulation, Coronary circulation and coronary venous drainage, Conduction System of Heart

MODULE II: CARDIAC PHYSIOLOGY

[12L]

Normal Cardiac Cycle, Pulse, Heart rate, Blood pressure, Cardiac output, Heart Sounds, Murmurs, Measurement of Blood Pressure: Technique: Sphygmomanometer, ECG and Cardiac Cycle, Physiology of Arrhythmias

MODULE III: HEMODYNAMICS OF THE HEART

[14L]

Pulmonary circulation, Systemic circulation: Effect of systemic diseases on cardiovascular anatomy and physiology, Coronary Circulation: Myocardial infarction, abnormal wall motion.

Types of flow - Factors affecting blood flow - Pressure gradient, Stenosis, Preload, Afterload
Disease states affecting afterload and preload

MODULE IV: CHAMBERS OF THE HEART

[10L]

Pressures, Wave Forms, Arterial, Venous Pressures and Wave Forms, Oxygen Saturations: Physiology of Oxygen Transport, Blood Gases – Technique and Various parameters, Various Gas laws

MODULE IV: PHYSICS OF CARDIAC PERFUSION

[8L]

Flow, pressure and resistance, Cardiac Cycle, Circulation, Tissue Perfusion – Unified Concept

Suggested Readings:

1. Handbook of Cardiac Anatomy, Physiology, and Devices Hardcover – 24 November 2015 by Paul A. Iaizzo (Editor)
2. The cardiovascular system basic science and clinical conditions (English, Paperback, Alan noble , Robert johnson, Alan thomas, Paul bass)
3. Cardiac Pacing: A Physiological Approach by Asit Das, Jaypee Brothers Medical Publishers
4. Cardiovascular Physiology Concepts by Klabunde R E , Wolters Kluwer | Lippincott Williams & Wilkins

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (ifapplicable)	Remarks (If any)
MODULE I	CARDIAC ANATOMY	16	35	1	5		
MODULE II	CARDIAC PHYSIOLOGY	12	25	2	5		
MODULE III	HEMODYNAMICS OF THE HEART	14	20	3	5		
MODULE IV	CHAMBERS OF THE HEART	10	15	4	5		
MODULE V	PHYSICS OF CARDIAC PERFUSION	8	5	5	5		

ELECTIVE II: CARDIOVASCULAR TECHNOLOGY - CLINICAL

Course Objectives:

1. To demonstrate Radiation Physics and Application, Medical Electronics.
2. To demonstrate ECG.
3. To demonstrate application of Exercise ECG.
4. To demonstrate echocardiography
5. To demonstrate Principle of Doppler
6. To provide basic comprehension of Principle of Holter Recording

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear demonstration of radiation physics and application, medical electronics	Module I
2	Students will be able to demonstrate electrocardiography	Module II
3	Students will be able to demonstrate the concept and exercise ECG of the heart	Module III
4	Students will be able to demonstrate about the echocardiography of heart	Module IV
5	Students will be able to get an idea about principle of DOPPLER	Module V
6	Students will be able to get an idea about HOLTER RECORDING	Module VI

MODULE I: RADIATION PHYSICS AND APPLICATION, MEDICAL ELECTRONICS [10L]

Two dimensional X-ray technique, Fluoroscopy, Video Fluoroscopy, X-ray tube, Absorption and scattering, X-ray spectrum and extra filtering, Image enhancement, Flat panel technology, Room shielding, Personnel reduction, Patient dose reduction, Symptoms of Radiation Toxicity, Registration and monitoring, Biological risk, Ergonomics, Introduction to basic principles of medical electronics, Calibration operation and clinical applications

MODULE II: ELECTROCARDIOGRAPHY [10L]

Basics and Principle, Electrode / Lead Placements, Normal ECG: Wave Form, Normal ECG: Intervals, ECG Machines: Functions, Frequency Response, Recording, Speed, Sensitivity, Standardization, Stylus Lag (Heat Stylus), ECG and Chamber Hypertrophy, ECG and Arrhythmia, ECG in Myocardial Infraction, Myocardial Ischemia, ECG in Miscellaneous Conditions: Metabolic, electrolyte changes, ECG for Technician

MODULE III: EXERCISE ECG [10L]

Equipment / Types of Exercise ECG, Indication / Contradiction, Lead Placement – Rationale, Limitation, Monitoring during Ex. ECG: Clinical / ECG / Parameters, Exercise ECG Protocol: Indications / Advantage and Disadvantage, Exercise Physiology, Exercise ECG: Preparation of

Patient / Equipment / Defibrillators, Emergency Drugs, Exercise ECG: Detection of Various Arrhythmias, Ischemia, and Plan of action, Post Exercise ECG: Observation, Instructions

MODULE IV: ECHOCARDIOGRAPHY [10L]

Principle of Echocardiography, Transducers, Anatomical Planes for Viewing in Echocardiography, Normal M-Mode Echo Study: Anatomy / Function: Measurements, Normal 2D Echo Study: Anatomy / Function: Measurements. Echo for Cardiac Function- systolic and diastolic, Echo in Heart Disease: Acquired, Congenital, Contrast Echocardiography: Technique and Indications, Transesophageal echocardiography, 3D Echocardiography, Echo Cardiograph: Technician's Role: Disposables, Archiving, Record Keeping, Stock-Indents, Stock Maintenance, Stock Verification

MODULE V: PRINCIPLE OF DOPPLER [12L]

Measurement of Flows and Gradients - Assessment of gradients, shunts, valve areas, cardiac output, Assessment of valve regurgitations, Utility of Doppler in Assessment of Cardiac Disease- Tissue Doppler, Stress Echocardiography: Protocols, 2D Echo Views, Analysis Trans -esophageal Echo - Indication / Contraindication, Patient Preparation, Transducer: Maintenance, Sterilization, Handling etc., Monitoring, Emergency Drugs, Utility, Intra Vascular Ultrasound, Intracoronary Doppler wire

MODULE VI: HOLTER RECORDING [8L]

Principles of Holter, Utility and indications, Analysis of Holter

Suggested Readings:

1. Multimodality Imaging Innovations In Adult Congenital Heart Disease Emerging Technologies 2021 Edition by Pastora Gallego, Israel Valverde , Springer
2. Practical Manual of Interventional Cardiology 2021 Edition by Annapoorna Kini, Samin K. Sharma, Springer
3. ASEs Comprehensive Strain Imaging 2021 Edition by Thomas H. Marwick, Theodore P. Abraham, Elsevier
4. ASEs Comprehensive Echocardiography 2021 Edition by American Society of Echocardiography, Elsevier

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	RADIATION PHYSICS	10	15	1	5		
MODULE II	ELECTRO CARDIOGRAPHY	10	15	2	5		
MODULE III	EXERCISE ECG	10	15	3	5		
MODULE IV	ECHO CARDIOGRAPHY	10	15	4	5		

MODULE V	PRINCIPLE OF DOPPLER	12	30	5	5		
MODULE VI	HOLTER RECORDING	8	10	6	5		

ELECTIVE III: CARDIAC PATHOLOGY AND PHARMACOLOGY

Course Objective:

1. To provide demonstration of cardiac pathology.
2. To provide demonstration of cardiac pharmacology.
3. To provide demonstration of cardiac monitoring

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear demonstration of cardiac pathology	Module I
2	Students will be able to demonstrate microbiological aspects of valvular heart disease	Module II
3	Students will be able to demonstrate the concept of pharmacology of the heart	Module III

MODULE I: CARDIAC PATHOLOGY

[20L]

Coronary artery disease and myocardial infarction, Rheumatic Fever, Valvular Heart Disease, Mitral stenosis, Mitral regurgitation, Aortic stenosis, Aortic regurgitation, Tricuspid valve disease
Combined valve diseases

MODULE II: MICROBIOLOGY OF VALVULAR HEART DISEASE

[20L]

Pericardial, Myocardial Diseases including Endocarditis, Hypertension, Pulmonary Hypertension, Congenital Heart Disease: Acyanotic, Cyanotic, Shunts - Left to Right Shunts, Right to Left Shunts, Heart Failure, Invasive Monitoring, CVP, Intra Arterial BP, PA Wedge Pressure, Cardiac Output

MODULE III: PHARMACOLOGY

[20L]

Modes / routes of Drug Administration (Rationale), Intra Venous Fluids: Crystalloids, Colloids, Common Cardiac Drugs –
PART-I: Digoxin, Diuretics, Vasodilators, Nitrates, and Common Cardiac Drugs
PART-II: Beta Blockers, Calcium Blockers, ACE inhibitor, Common Cardiac Drugs

PART-III: Antiarrhythmic drugs, Positive inotropic drugs, Drugs for Cardiac Resuscitation, Drugs for all Cardiac and Medical Emergencies, Contrast Media, Adverse Reactions to Contrast Media, Heparin, Protamine, Identification of Anaphyaxis and Immediate Management, Drug reactions, Drug interaction (Basics)

Suggested Readings:

1. Oxford Textbook of Clinical Pharmacology and Drug Therapy 3E (Pb) by Grahame Smith, Oxford University Press
2. Cardiac Drug Therapy 6/E by Khan MG, Saunders
3. Pharmacology and Pharmacotherapeutics, by Satoskar (Author)
4. Cardiac Drug Therapy by Khan, Springer Humana

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	CARDIAC PATHOLOGY	20	35	1	5		
MODULE II	MICROBIOLOGY OF VALVULAR HEART DISEASE	20	35	2	5		
MODULE III	PHARMACOLOGY	20	30	3	5		

ELECTIVE IV: CARDIOVASCULAR TECHNOLOGY - APPLIED

Course Objectives:

1. To give detailed in Cardiac Catheterization lab.
2. To give detailed information in Equipments in Cath-Lab.
3. To give detailed information in hazard management
4. To give detailed information about waste management and their importance
5. To give detailed information about Angiography
6. To give detailed information in advanced Equipments in Cath-Lab.
7. To give detailed information in various diagnostic and Therapeutic procedures in cathlab

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear demonstration of cardiac catheterization in brief	Module I
2	Students will be able to demonstrate cath-lab equipment and their usage	Module II
3	Students will be able to demonstrate the concept of hazard management	Module III
4	Students will be able to demonstrate about wastes management and their importance	Module IV
5	Students will be able to get an idea about angiography	Module V
6	Students will be able to get an idea about advanced cardiac catheterization in detail	Module VI
7	Students will be able to get an idea about special procedures required in heart treatment	Module VII

MODULE I: CARDIAC CATHETERIZATION PART I

[12L]

Cardiac Catheterization: Laboratory Setup / Types of Procedures - Sterile Techniques in Cath Lab / Sterile Areas, Sterile Procedure, sterile trolley setting, Scrubbing, gowns and Gloves, scrubbing and draping Patients, handling sterile disposables etc. Sterilization and re-use of hardware.

MODULE II: CATH-LAB EQUIPMENTS

[12L]

Defibrillator / Pacemaker / IABP / BOYLE's Apparatus / Suction Machine / oxygen, Infusion Pumps / Programmed Stimulators, Pacing System Analyzers, Hemodynamic Recorders (Physiological Records), Transducers, Recording of Pressure Wave Form: Range / Gain / Speed / Systolic / Diastolic And Mean Pressures In Chambers And Vessels

MODULE III: HAZARD MANAGEMENT

[6L]

Radiation Protection

Infection Prevention

Injury Prevention: Electrical / Mechanical

MODULE IV: WASTES MANAGEMENT**[4L]**

Plastics, Biological Wastes, Glass / Needle / Syringes, Metallic Waste

MODULE V: ANGIOGRAPHY**[6L]**

Cine Angiography: Cine Filming, Cine Film Processing and Cine Film Viewing, Cine film library, Contrast Media

MODULE VI: CARDIAC CATHETERIZATION - PART-II**[10L]**

Cardiac Catheterization Procedure: Diagnostic Studies, Therapeutic / Interventional Procedures, Acquisition of CathData: Cardiac Output / Oximetry and Shunts, Pressures and Wave Forms; Recording Technique, Cardiac Catheterization, Application of Echocardiography, Complication of Cardiac Catheterization: Recognition and management

MODULE VII: SPECIAL PROCEDURES**[10L]**

Pericardial Tap, Atrial Septostomy, Endomyocardial Biopsy, Balloon Angioplasty (Valve), Coronary Angioplasty Puncture Needles (Vascular Access Needles), Woven Dacron Catheters: GL, NIH, Lehman, Woven Dacron Electrode Catheters, Flow Directed Catheters (Swan Ganz Type) Balloon Angio Catheters, Polyurethane Catheters: Pig Tail, Judkins, Coronary, Amplatz Coronary, Brachial Coronary, Sones Catheters

Suggested Readings

1. Textbook of Cardiovascular Technology Hardcover – Import, 1 November 1987 By Lynn Bronson (Author)
2. Essential Cardiac Technology Hardcover – Import, 1 February 1996, By Piller (Author)
3. A Text book of Electrocardiography - Goldberger
4. Nanda's A text book of Echocardiography

Module No.	Content	Total Hours	%age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	CARDIAC CATHETERIZATION PART I	12	20	1	5		
MODULE II	CATH-LAB EQUIPMENTS	12	25	2	5		
MODULE III	HAZARD MANAGEMENT	6	10	3	5		
MODULE IV	WASTES MANAGEMENT	4	5	4	5		
MODULE V	ANGIOGRAPHY	6	10	5	5		
MODULE VI	CARDIAC CATHETERIZATION – PART-II	10	15	6	5		
MODULE VII	SPECIAL PROCEDURES	10	15	7	5		

DSE 3: RENAL REPLACEMENT THERAPY&DIALYSIS TECHNOLOGY

ELECTIVE I: CONCEPTS OF RENAL DISEASES

Course Objectives:

- 1 To demonstrate the normative data and be able to classify a patient by hypertension stage
2. To evaluate and differential diagnosis of microscopic hematuria
3. To evaluate and management of a child with a suspected UTI
4. To demonstrate basic concepts of transplant medicine

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear information of Renal anatomy and physiology	Module I
2	Students will be able to demonstrate Renal diseases	Module II
3	Students will be able to demonstrate the concept and causes of renal failure	Module III
4	Students will be able to demonstrate complication of renal diseases	Module IV
5	students will be able to demonstrate renal replacement therapies	Module V

MODULE I: RENAL ANATOMY AND PHYSIOLOGY

[28L]

UNIT 1: Basic anatomy of urinary system

- a. The Kidney (structural anatomy)
- b. The ureter
- c. the bladder
- d. The urethra
- e. Sphincters
- f. Prostate
- g. Renal Vasculature

UNIT 2: Gross anatomy of the kidney

- a. Location of kidney
- b. Size
- c. Protection
- d. Structure of the Kidney – gross structure blood supply, nerve supply, lymphatic flow, LS of Kidney

UNIT 3: Microscopic anatomy

- a. Nephron : Glomerular structure, tubules
- b. Interstitium
- c. Juxta Glomerular apparatus

UNIT 4: Embryology and fetal development in brief

UNIT 5: Composition and function of blood - Introduction

- a. Red blood cells: Erythropoiesis, stages of differentiation function, count physiological variation.
- b. Haemoglobin: structure, functions, concentration physiological variation methods of Estimation of Hb
- c. White blood cells: Production, function, life span, count, differential count
- c. Platelets: Origin, normal count, morphology functions.
- d. Plasma Proteins – Production, concentration, types, albumin, globulin, Fibrinogen, prothrombin functions
- e. Hemostasis & Blood coagulation: Hemostasis: Definition, normal hemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.
- f. Blood Bank: Blood groups
- g. Blood transfusion – Indication, universal donor and recipient concept
- h. Selection criteria of a blood donor. transfusion reactions Anticoagulants – Classification, examples and uses
- i. Anemia's: Classification – morphological and etiological. Effects of anaemia on body
- j. Erythrocyte sedimentation rate (ESR) and Packed cell volume
- k. Blood Volume: Normal value, determination of blood volume and Regulation of Blood Volume

MODULE II: OVERVIEW OF RENAL DISEASES

[6L]

Acute renal failure, nephritic syndrome – primary & secondary, nephritic syndrome, uti – urinary tract infections

MODULE III: INTRODUCTION TO RENAL FAILURE

[2L]

Asymptomatic urinary abnormalities, chronic renal failure, renal stone diseases, obstructive uropathies

MODULE IV: COMPLICATION OF RENAL DISEASES

[8L]

Congenital & inherited renal diseases, tumors of kidney, pregnancy associated renal diseases, renal vascular disorders & hypertension associated renal diseases

MODULE V: BASICS IN RENAL REPLACEMENT THERAPIES

[16L]

1. History of haemodialysis and peritoneal Dialysis
2. Basic principles of hemodialysis and peritoneal Dialysis
3. Hollow fibredialyser: technical and clinical consideration
 - Biocompatibility
 - Membrane types
 - Advanced Dialyser Membranes
 - Flux of the membrane
 - KoA

- Kuf
- Clearance
- Sterilisation method

Suggested Readings:

1. Renal Disease Prevention and Management (API): A Physician's Perspective, Jaypee Brothers Medical Publishers
2. The Renal System At A Glance by Chris, O Callaghan, New Age International (P) Ltd
3. Principles of Renal Physiology 2012 Edition by Christopher J. Lote , Springer
4. The Renal Drug Handbook The Ultimate Prescribing Guide For Renal Practitioners 5Th Edition by Caroline Ashley and Aileen Dunleavy, CRC Press

ModuleNo.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	RENAL ANATOMY AND PHYSIOLOGY	28	45	1	11		
MODULE II	OVERVIEW OF RENAL DISEASES	6	15	2	11		
MODULE III	INTRODUCTION TO RENAL FAILURE	2	10	3	11		
MODULE IV	COMPLICATION OF RENAL DISEASES	8	10	4	11		
MODULE V	BASICS IN RENAL REPLACEMENT THERAPIES	16	20	5	11		

ELECTIVE II: RENAL DISEASES THERAPEUTICS

Course objectives:

1. To comprehend the various presentations of kidney diseases
2. To Learn how to diagnose and evaluate patients with various disease conditions like Acute renal failure, nephritic syndrome, urinary tract infection, Asymptomatic urinary abnormalities, Chronic Kidney Disease (especially stage v) renal stone diseases, obstructive nephropathies, congenital & inherited renal diseases, pregnancy associated renal diseases, renal vascular disorders and hypertension associated renal diseases, renal vascular disorders and hypertension associated renal diseases
3. To Learn to order appropriate test towards confirmation of diagnosis
4. To Learn to initiate therapy in each of these conditions

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear information of pharmacology and drug related to renal diseases	Module I
2	Students will be able to demonstrate the fluid and electrolyte disorders in Renal diseases	Module II
3	Students will be able to demonstrate the epidemiology of kidney disease	Module III
4	Students will be able to assess the complication of renal diseases	Module IV

MODULE I: PHARMACOLOGY AND DRUG

[8L]

Handling of drugs in kidney disease Drug- induced nephropathies, Clinical use of diuretics, Systemic cancer therapies and the kidney

[10L]

MODULE II: FLUID AND ELECTROLYTE DISORDERS

Hypo/hyponatremia, Disorders of water balance, Hypo/hyperkalemia, Hypo/hypercalcemia, Hypo/hyperphosphatemia, Hypo/hypermagnesemia , Clinical acid- base disorders

MODULE III: EPIDEMIOLOGY OF KIDNEY DISEASE

[20L]

Epidemiology of kidney disease Kidney disease in Indian subcontinents, Risk factors of CKD Nephron endowment, Aging and kidney disease, CKDU (chronic kidney disease of unknown etiology)

MODULE IV: ASSESSMENT OF RENAL DISEASE

[22L]

History and clinical examination of patients with renal disease, Urinalysis and microscopy, Clinical assessment of renal function, Renal function in the newborn infant ,The aging kidney , Imaging in renal disease ,Renal biopsy Immunological investigation of renal disease

Suggested Readings:

1. Renal Disease Prevention and Management (API): A Physician's Perspective, Jaypee Brothers Medical Publishers

2. The Renal System At A Glance by Chris, O Callaghan, New Age International (P) Ltd
3. Principles of Renal Physiology 2012 Edition by Christopher J. Lote , Springer
4. The Renal Drug Handbook The Ultimate Prescribing Guide For Renal Practitioners 5Th Edition by Caroline Ashley and Aileen Dunleavy, CRC Press

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	PHARMACOLOGY AND DRUG	8	20	1	11		
MODULE II	FLUID AND ELECTROLYTE DISORDERS	10	20	2	11		
MODULE III	EPIDEMIOLOGY OF KIDNEY DISEASE	20	25	3	11		
MODULE IV	ASSESSMENT OF RENAL DISEASE	22	35	4	11		

ELECTIVE III: DIALYSIS TECHNOLOGY

Course Objective:

1. To have Start and close haemodialysis sessions independently
2. To have basic idea in Successful cannulate arterio-venous fistulae for hemodialysis
3. To be able to give training patients and their caregivers in performing peritoneal dialysis
4. To demonstrate the water maintenance for the haemodialysis room

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear information of Dialysis	Module I
2	Students will be able to explain the need of safe Dialysis delivery system	Module II
3	Students will be able to demonstrate the concept of Nutritional management of patients	Module III
4	Students will be able to demonstrate quality assurance needed in dialysis	Module IV

MODULE I: INTRODUCTION TO DIALYSIS

[20L]

History, types of Dialysis, Principles of Dialysis, quantification of adequacy, Dialysis Team-rights-responsibilities-patient doctor relationship, Dialysis reuse, Dialyser Membranes, Vascular Access – Temporary & Permanent, Equipment – Accessories – Function, Computer applications in Dialysis

MODULE II: OVERVIEW OF DIALYSIS DELIVERY SYSTEM

[14L]

Daily sate delivery system, Composition of dialysate, High flux / high efficiency dialysis, Continuous Renal Replacement Therapy / Slow Low Efficiency Dialysis, Complications in dialysis patients, Water treatment-pretreatment, deionizer, Reverse Osmosis, Dialysis in Neonates, infants & children, Renal data maintenance

MODULE III: NUTRITIONAL MANAGEMENT OF PATIENTS

[16L]

Machine and patient monitoring during hemodialysis , Patient Assessment – Pre, intra & post dialysis , Lab data analysis, Acute and chronic dialysis prescription, Medications in dialysis patients, Nutrition management in dialysis patients, Anticoagulation, Infection control and universal precautions

MODULE IV: QUALITY ASSURANCE OF DIALYSIS

[10L]

Psychosocial aspects & patient education, Quality assurance in dialysis, Complications of hemodialysis – Acute & chronic, Acute and Chronic Peritoneal Dialysis, History, access, physiology of Peritoneal Dialysis, PD – Transport kinetics, ultrafiltration, UF, Intermittent PD,

Continuous Ambulatory Peritoneal Dialysis, Automated Peritoneal Dialysis, Dialysis Solutions, Novel uses of PD, Infectious and noninfectious complications of PD, Renal transplant co-ordination (Recipient and donor workup, psychosocial and legal aspects, cadaver donor Maintenance, principles of post-operative management and follow-up)

Suggested Readings

1. Clinical text of Nephrology By John Fegally
2. Text book of Nephrology –Oxford and Brenner Rector (Reference only)
3. Textbook of Dialysis therapy – Nissenson (Reference only)
4. Textbook of Peritoneal Dialysis – Ram Gokal (Reference only)

Module No.	Content	Total Hours	%ageof questions	Covered CO	Covered PO	BloomsLevel (ifapplicable)	Remarks (If any)
MODULE I	INTRODUCTION TO DIALYSIS	20	30	1	11		
MODULE II	OVERVIEW OF DIALYSIS DELIVERY SYSTEM	14	25	2	11		
MODULE III	NUTRITIONAL MANAGEMENT OF PATIENTS	16	25	3	11		
MODULE IV	QUALITY ASSURANCE OF DIALYSIS	10	20	4	11		

ELECTIVE IV: PHARMACOLOGY RELATED TO HAEMO & PERITONEAL DIALYSIS

Course Objective:

1. To demonstrate the safe demonstration procedures associated with peritoneal dialysis
2. To demonstrate the drugs and their usages associated with peritoneal dialysis
3. To recognize a contamination and take appropriate action
4. To demonstrate the aseptic technique associated with peritoneal dialysis

Course Outcomes (CO):

SL NO.	Course Outcome	Mapped Modules
1	Students will be able to have clear information of Renal diseases	Module I
2	Students will be able to explain the relationship between drugs and treatment	Module II
3	Students will be able to demonstrate the concept of Nutrition	Module III
4	Students will be able to demonstrate haemodialysis	Module IV

MODULE I: EMPHASIS TO RENAL DISEASES

[10L]

1. IV Fluid Therapy with Special Emphasis in Renal Diseases
2. Diuretics – Classification, Actions, Dosage, Side Effects & Contraindications
3. Anti Hypertensives – Classification, Actions, Dosage, Side Effects & Contraindications, Special Reference During Dialysis, Vasopressors, Drugs Used In Hypotension

MODULE II: INTRODUCTION TO DRUGS

[14L]

4. Drugs & Dialysis – Dose & Duration Of Administration Of Drugs
5. Dialysable Drugs – Phenobarbitone, Lithium, Methanol Etc.

MODULE III: OVERVIEW ON NUTRITIONAL ASPECTS

[16L]

6. Vitamin D & Its Analogues, Phosphate Binders, Iron, Folic Acid & Other Vitamins Of Therapeutic Value
7. Erythropoietin In Detail
8. Heparin Including Low Molecular Weight Heparin
9. Protamine Sulphate
10. Formalin, Sodium Hypochlorite, Hydrogen Peroxide – Role As Disinfectants & Adverse Effects Of Residual Particles Applicable To Formalin

MODULE IV: INTRODUCTION TO HAEMODIALYSIS

[20L]

11. Haemodialysis Concentrates – Composition & Dilution (Acetate & Bicarbonates)
12. Peritoneal Dialysis Fluid In Particular Hypertonic Solutions – Composition
13. Potassium Exchange Resins With Special Emphasis On Mode Of Administration

Suggested Readings:

1. Pharmacotherapy: A Pathophysiologic Approach, 10e,
2. Joseph T. DiPiro, Robert L. Talbert, Gary C. Yee, Gary R. Matzke, Barbara G. Wells, L. Michael Posey
3. Oxford handbook of dialysis (4 ed) Jeremy Levy, Edwina Brown and Anastasia Lawrence
4. BASICS of DIALYSIS Hardcover – by Ayesha mugheer (Author), Ayesha Mugheer (Author)
5. The Textbook of Peritoneal Dialysis, Editors: Gokal, R., Nolph, K.D. (Eds.)

Module No.	Content	Total Hours	% age of questions	Covered CO	Covered PO	Blooms Level (if applicable)	Remarks (If any)
MODULE I	EMPHASIS TO RENAL DISEASES	10	20	1	11		
MODULE II	INTRODUCTION TO DRUGS	14	20	2	11		
MODULE III	OVERVIEW ON NUTRITIONAL ASPECTS	16	25	3	11		
MODULE IV	INTRODUCTION TO HEAMODIALYSIS	20	35	4	11		