



Department of Paramedical Sciences
Faculty of Allied Health Sciences
SGT UNIVERSITY

Shree Guru Gobind Singh Tricentenary University

Gurgaon-122505

Syllabus

B.Sc. MEDICAL TECH. (CARDIAC CARE)

Duration: 3 years (6 Semester)

W.e.f. Academic Session 2021-22

HUMAN ANATOMY-I

Semester I

UNIT-I

Introduction: human body as a whole

Definition of anatomy and its subdivisions

Anatomical nomenclature and terminology (planes & positions)

Surface Anatomy of main structures and vessels

Applied anatomy & Joints

Musculoskeletal system

Connective tissue & its modification, tendons, membranes, special connective tissue.

Bone structure, blood supply, growth, ossification, and classification.

Muscle classification, structure and functional aspect.

Joints classification, structures of joints, movements, range, limiting factors, stability, blood supply

Nerve supply, dislocations and applied anatomy

UNIT-II

Extremity (Lower & Upper extremities)

Bony architecture

Joints – structure, range of movement

Muscles – origin, insertion, actions, nerve supply

Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies

Radiographic identification of bone and joints Applied anatomy

Lower extremity

Bony architecture

Joints – structure, range of movement

Muscles – origin, insertion, actions, nerve supply

Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies

Radiographic identification of bone and joints Applied anatomy

UNIT-III

Spine and thorax

Back muscles -Superficial layer

Deep muscles of back, their origin, insertion, action and nerve supply.

Vertebral column – Structure & Development, Structure & Joints of vertebra. Thoracic cage

Head and neck: Cranium

Facial Muscles – origin, insertion, actions, nerve supply Temporal mandibular Joints – structure, types of movement

UNIT-IV

Cardiovascular system (with relevant applied anatomy)

Heart-Size, location, chambers.

Circulation -Systemic & pulmonary

Great vessels of the heart, branches of aorta.

Overview of blood vessels of upper extremity and lower extremity

Lymphatic system- (with relevant applied anatomy)

Salient features of lymphatic organs (spleen, tonsil, thymus, lymph node)

UNIT-V

Gastro-intestinal system (with relevant applied anatomy)

Part of the gastrointestinal tract

Gross anatomy of Tongue, stomach, small and large intestine, liver, gall bladder Pancreas and other digestive organ & related applied anatomy

Respiratory system (with relevant applied anatomy)

Parts of respiratory system with salient gross features of lung

Brief description of intercostal muscles and Para-nasal air sinuses

HUMAN ANATOMY I-PRACTICAL

- 1) Identification and description of all anatomical structures.
- 2) Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
- 3) Demonstration of skeleton-articulated and disarticulated.
- 4) Surface anatomy: Surface landmarks-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

HUMAN PHYSIOLOGY-I

UNIT-I

General Physiology

Cell: morphology, Structure and function of cell organelles Structure of cell membrane

Transport across cell membrane Intercellular communication Homeostasis

Blood

Introduction-composition & function of blood

W.B.C., R.B.C., Platelets formation & functions, Immunity

Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups-types, significance, determination.

Hemoglobin, Haemostasis

Lymph-composition, formation, circulation & functions

UNIT-II

Cardiovascular system

Conducting system-components, impulse conduction Heart valves Cardiac cycle-definition, phases of cardiac cycle.

Cardiac output-definition, normal value, determinants.

Stroke volume and its regulation.

Heart rate and its regulation:

Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure.

Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes during exercise

UNIT-III

Respiratory System

Mechanics of respiration Lung volumes and capacities

Pulmonary circulation, transport of respiratory gases

Factors affecting respiration, Regulation of respiration-neural regulation, voluntary control and chemical regulation

Hypoxia, Hypercapnoea, Hypocapnoea,

Artificial respiration Disorders of respiration- dyspnoea, orthopnoea, hyperpnoea, hyperventilation, apnoea, Tachypnoea, Respiratory changes during exercise.

Digestive System Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation
Functions of Liver & Stomach

UNIT-IV

Nervous system

Introduction, central and peripheral nervous system, functions of nervous system

Reflexes-monosynaptic, polysynaptic, superficial, deep & withdrawal reflex Sense organ, receptors, electrical & chemical events in receptors.

Sensory pathways for touch, temperature, pain, proprioception & others.

Control of tone & posture: Integration at spinal, brain stem, cerebellar, basal ganglion levels, along with their functions.

Motor mechanism: motor cortex, motor pathway: the descending tracts -pyramidal & extrapyramidal tracts-origin, course, termination & functions. Upper motor neuron and lower motor neuron paralysis.

Special senses-eye, ear, nose, mouth

Water excretion, concentration of urine-regulation of Na⁺, Cl⁻, K⁺ excretion

Nerve Muscle Physiology

Muscles-classification, structure, properties, Excitation, contraction, coupling, Motor unit, EMG, factors affecting muscle tension, Muscle tone, fatigue, exercise .

Nerve – structure and function of neurons, classification, properties Resting membrane potential & Action potential their ionic basis, All or None phenomenon Neuromuscular transmission Ionic basis of nerve conduction.

Concept of nerve injury & Wallerian degeneration Synapses.

Electrical events in postsynaptic neurons Inhibition & facilitation at synapses .

Chemical transmission of synaptic activity Principal neurotransmitters. Chemical transmission of synaptic activity Principal neurotransmitters.

HUMAN PHYSIOLOGY I-PRACTICAL

1. Haemoglobinometry
2. WhiteBloodCellcount
3. RedBloodCellcount
4. DeterminationofBloodGroups
5. Leishman'sstainingandDifferentialWBCcount
6. DeterminationofpackedcellVolume
7. Erythrocytesedimentationrate[ESR]
8. CalculationofBloodindices
9. DeterminationofClottingTime,BleedingTime

BASIC BIOCHEMISTRY

Basic concept of metabolism and their applied aspects

Unit-I

Carbohydrates: Definition, function and classification of carbohydrate. Monosaccharide, glycoside formation, oligosaccharides and polysaccharides. Glycolysis, catabolic fates of pyruvate, metabolic fate of Acetyl-CoA and Citric acid cycle, gluconeogenesis, glycogen metabolism, pentose phosphate pathway.

Unit-II

Amino acids and proteins: Definition, structure, classification, essential & non essential amino acids. Proteins definition and classification. Primary, secondary, tertiary and quaternary of proteins of proteins

Unit-III

Vitamins: Definition and classification of vitamins, difference between fat soluble and water soluble vitamins. Water soluble vitamins and fat soluble vitamins

Unit-IV

Lipids: Definition, classification and function of lipids. Fatty Acids, Triacylglycerols or Triacylgcerides or neutral fat. Fatty acid metabolism. Ketone body metabolism.

BASIC BIOCHEMISTRY-PRACTICAL

PAPER CODE-05270106

B. Sc. Semester I (MLT)

L T P Credits

- - 1/2

Examination:

30 Marks

Int. Assessment:

20 Marks

Total:

50 Marks

1. Identification of carbohydrates by Molisch's test.
2. Identification of reducing sugar by Benedict's test.
3. Identification of protein by Biuret's test.

SEMESTER 1

PAPER 4

Communication skill and personality development

Total Hours 50

S.NO	TOPIC	METHOD	HOURS
1	Listening Comprehension, Speeches, Interviews, audio-video clippings followed by exercises, Introduction to Communication, Importance of Communication, Barriers to Communication and ways to overcome them.		
2	Conversation Skills, Greetings and Introducing oneself, Framing questions and answers, Role play, Buying: asking details etc, Word formation strategies, Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution		
3	Reading Comprehension, Simple narration and Stories, Newspaper and articles clippings, Sentence types, Note Making, Paragraph Writing, Comprehension, Report Writing: types, characteristics.		
4	Pronunciation, Pronunciation, Syllable and Stress, Into nation and Modulation.		

5	Writing Comprehension, Letters: types, format, style, Précis Writing, Paragraph: Order, Topic sentence, consistency, coherence, Report and Proposal, Project Writing: Features, Structure.		

**SEMESTER 2
PAPER 1**

PATHOLOGY

S.NO	TOPIC	METHOD	HOURS
1	Introduction of pathology Cell injury - types, etiology, morphology, Cell death-autolysis, necrosis, apoptosis, Cellular adaptations-atrophy, hypertrophy, hyperplasia, metaplasia. Inflammation- acute inflammation-vascular events, cellular events, chemical mediators, chronic inflammation-general features, granulomatous inflammation, tuberculosis. Healing and repair - Definition, different phases of healing, factors influencing wound healing, fracture healing. Haemodynamic disorders-Oedema, hypermia, congestion, haemorrhage, embolism, thrombosis, infarction. Neoplasia - definition, nomenclature, features of benign and malignant tumors, spread of tumors, dysplasia, carcinoma in situ, precancerous lesions. Environmental and nutritional pathology - smoking, radiation injury, malnutrition, obesity, vitamin deficiencies.		
2	Haematological Disorders, Introduction and Haematopoiesis, Anaemia - introduction and classification (morphological and etiological), iron deficiency anemia: distribution of body iron, iron absorption, causes of iron deficiency , lab findings, megaloblastic anaemia: causes, lab findings, haemolytic anemias: definition. Causes, classification and		

	lab findings.WBC disorders - quantitative disorders, leukemia - introduction and classification, acute leukemias, chronic leukemias. Bleeding disorders - introduction, physiology of hemostasis. Classification, causes of inherited and acquired bleeding disorders, thrombocytopenia, DIC, laboratory findings. Pancytopenia.		
3	Basic Hematological Techniques : Blood collection - methods (capillary blood, venipuncture, arterial puncture) complications, anticoagulants, transport of the specimen, preservation, effects of storage, separation of serum and plasma, universal precautions, complete hemogram - CBC, peripheral smear, BT, CT, PT, APTT, ESR, disposal of the waste in the laboratory.		
4	Transfusion Medicine Selection of donor, blood grouping, Rh typing, cross matching, storage, transfusion transmitted diseases, transfusion reactions, components - types, indications		
5	Clinical Pathology collection, transport, preservation, and processing of various clinical specimens. Urinalysis - collection. Preservatives, physical, chemical examination and microscopy. Physical examination; volume, color, odor, appearance, specific gravity and ph, Chemical examination; strip method- protein - heat and acetic acid test, sulfosalicylic acid method, reducing sugar-benedicts test, ketone bodies - rothas test, bile salt - hays method, blood - benzdine test, urobilinogen and porphobilinogen - ehrlich aldehyde and schwartz test, bence jones protein.		

PRACTICAL PATHOLOGY

S.NO	TOPIC	METHOD	HOURS
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1	I. HAEMATOLOGY Hb Estimation-Sahli's method & Cyanmethhaemoglobin method RBC Count Retic count Preparation of blood smears and staining with Leishman stain WBC Count WBC-Differential Count Platelet Count Absolute Eosinophil Count ESR-Westergrens & Wintrobe's method PCV Sickling test-Demonstration Bone Marrow Smear Preparation & staining procedure Demonstration of Malarial Parasite		
2	I. CLINICAL PATHOLOGY Urine Examination (Physical, Chemical, Microscopic)		

SEMESTER 2

PAPER 2

MICROBIOLOGY

50 HOURS

S.NO	TOPIC	METHOD	HOURS
	Principles of Microbiology: Microscope- Different types		

	including electron microscope. - General introduction, and History of Microbiology - Classification of Microbes - Bacteria Cell - Bacterial Growth and Variation - Antibacterial Agents, and Anti-septics & Disinfection (Chemical Sterilization) - Sterilization (Physical)- Heat, Filters, Radiation. - Equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization - Antibiotics, Chemotherapy and Drug Resistance Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections. - Collection & Transportations of specimens.		
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PRACTICAL MICROBIOLOGY

S.NO	TOPIC	METHOD	HOURS
1	Compound microscope and its application in microbiology.		
2	Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters.		
3	Grams staining. Acid fast staining.		

4	Principles and practice of Biomedical waste management.		

**SEMESTER 2
PAPER 3**

APPLIED ANATOMY & PHYSIOLOGY THEORY

25 HOURS

S.NO	TOPIC	METHOD	HOURS
1	EXCRETORY SYSTEM PARTS OF EXCRETORY SYSTEM SHAPE OF KIDNEY, BLOOD SUPPLY COMPONENTS OF KIDNEY , NEPHRON ,NERVE SUPPLY. URINE FORMATION (FILTRATION , ABSORPTION & SECRETION) ACID , BASE MANAGEMENT . RENAL DISEASE (AKI, CKD & STONES)		
2	Male & female reproductive system Parts of male and female reproductive system with salient gross features of testis & uterus, ovary and fallopian tube Male -Functions of testes, pubertal changes in males, Testosterone -action & regulations of secretion.Female -Functions of ovaries and uterus, pubertal changes, Menstrual cycle, estrogens and progesterone - action and regulation Embryology Spermatogenesis & oogenesis Ovulation,fertilization, Placenta, Fetalcirculation.		
3	Endocrinology Physiology of the endocrine glands – Hormones secreted by these glands Their classifications and functions Adrenal, Gonads Thymus, Pancreas. Pituitary Thyroid, Parathyroid		
4	Nervous system Classification of the nervous system, Definitions of central, peripheral and autonomic nervous system Neuron- structure and classification, neuroglia Names of lobes of Cerebrum and cerebellum, Parts of brainstem (salient features only) .Cerebrospinal fluid and its circulation, names of cranial nerves, spinal nerve, meninges, ventricles (salient features only) Sensory organs Skin: Its appendages and functions Eye: Parts of eye and its structure Ear: Parts of ear- external, middle and inner ear and contents		

ANATOMY PRACTICAL

- 5) Identification and description of all anatomical structures.
- 6) Demonstration of dissected parts
- 7) Demonstration of skeleton-articulated and disarticulated.
- 8) Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

SEMESTER 2 PAPER 4

PHARMACOLOGY

50 HOURS

S.NO	TOPIC	METHOD	HOURS
1	GENERAL PHARMACOLOGY : Principles of drug administration and routes of administration and routes of administration, Pharmacokinetics : absorption, distribution, metabolism, excretion of drugs, factors influencing drug action, dosage and factors modifying it. Pharmacodynamics Drug allergy , poisoning & toxicity, synergetic antagonistic effect of drugs plasma half life , drug efficacy & potency , mechanism of drug action, adverse drug reaction		
2	ANS : Cholinergic & anticholinergic drugs , skeletal muscle relaxant, Sympathomimetics drugs(adrenergic drugs) , alpha & beta blockers		
3	CNS : Sedative & hypnotics , local & general anesthetics , Antiepileptic & Antipsychotics, Antidepressant & Analgesics		
4	CVS : Antihypertensive drugs , Anti-anginal drugs , Anti arrhythmic drugs, Cardiac glycosides, plasma expanders		
5	Antiemetic & Diuretics , UTI DRUGS		

SEMESTER 2 PAPER 5

FUNDAMENTALS OF COMPUTER SCIENCE

50 HOURS

S.NO	TOPIC	METHOD	HOURS
1	Introduction about computers What are Computers? Its various characteristics, applications and limitations. Functional Block Diagram of computer.		

	Computer Architecture: Classification of computer on basis of Purpose, signal and size and portability. Evolution of computer from 1st generation to fourth generation. Some description about fifth generation. Data representation in memory		
2	Hardware: To study the various input devices used: Keyboard, mouse, OMR, OCR, MICR, BCR, Scanner etc. To study the internal structure of CPU: Registers, ALU, Motherboard, HD, Memory, Cache, and Virtual Memory. TO study the various Secondary storage devices: Magnetic Disk, Optical Disk, Flash memory, To cover what are Monitor, Its types, Printer: Dot matrix, Daisy wheel. Line printer, Laser printer, Thermal Printer, Ink Jet printers etc.		
3	To cover the types of Software, Languages and their types (High level and low level language.) To cover the definition of operating system, its types and what are the various functions and types of operating system. Basic introduction about Interfaces: its types character user and graphical user interface (DOS and Windows) Basic introduction about linux, Unix operating system To study the various HTML tags (Bold tags, Italic, Underline, Marquee, Img, anchor etc.)		
4	Network: Data Communication, Structure of Universal Resource Locator, Domains (.com, .in, .country specific, .org and rationale behind them), HTTP Practicals: TO cover the various MS Excel Formulas and preparation of spreadsheets. Basics of E-mail, Web browsers (IE, Google Chrome, Mozilla), LAN, LAN topologies, WAN, MAN, Internet: Introduction, Internet, extranet and Intranet. Network devices (Hub, Switches, Modems, Routers etc), DNS, Network Security and Search Engine IP address, Structure of IP Address Backbone network, Network connecting devices		

B.Sc CARDIAC CARE**SEMESTER 3****PAPER 1****APPLIED PATHOLOGY (THEORY)****50 HOURS**

S.NO	TOPIC	METHOD	HOURS
1	Atherosclerosis-definition, risk factors, pathogenesis, morphology and complications, Ischemic heart disease: Myocardial infarction- definition, pathogenesis, morphology and complications, Hypertension- Benign and malignant hypertension: pathogenesis, pathology and complications		
2	Heart failure-Right and left heart failure: causes, pathophysiology and morphology, Rheumatic heart disease and infectious endocarditis- definition, etiopathogenesis, morphology and complications, Congenital heart disease-Types and atrial septal defect; aneurysms- types and morphology; cardiomyopathies in brief.		
3	Atelectasis - types, Adult respiratory distress syndrome - causes , pathogenesis and morphology; pulmonary edema- classification, causes and morphology, Chronic obstructive pulmonary disease- Chronic bronchitis, emphysema, asthma, bronchiectasis: Definition, etiopathogenesis and morphology, Restrictive pulmonary diseases- Definition, categories, pathogenesis and morphology		
4	Pneumoconiosis-types, asbestosis, coal workers pneumoconiosis-etiopathogenesis and morphology, Pulmonary embolism, infarction, pulmonary hypertension-Definition, etiopathogenesis and morphology, Pneumonia-Classification of pneumonias; Lobar pneumonia and bronchopneumonia - etiology, pathology and complications		
5	Clinical manifestations of renal diseases, Glomerular lesions in systemic diseases- diabetes, amyloidosis and systemic lupus erythematosus, Pericardial and pleural		

	effusions- causes and microscopy.		
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PRACTICAL

25 HOURS

S.NO	TOPIC	METHOD	HOURS
1	Urine examination: physical, chemical, microscopy		
2	Blood grouping & Rh typing		
3	Hemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR)		
4	Specimens : HEART & GREAT VESSELS SPECIMENS, LUNGS SPECIMENS , KIDNEY SPECIMEN , LIVER SPECIMENS		

B.Sc CARDIAC CARE TECHNOLOGY

SEMESTER 3

PAPER 2

PHAMACOLOGY (PART 2)

50 HOURS

S.NO	TOPIC	METHOD	HOURS
1	CHEMOTHERAPY OF INFECTIONS : BACTERIOSTATIC & BACTERIOCIDAL DRUGS , SULPHONAMIDES , PENICILLIN, CEPHALOSPORINS MACROLIDES, AMINOGLYCOSIDES, ANTITUBERCULER DRUGS , ANTIVIRAL , ANTIRETROVIRAL , ANTIFUNGAL , ANTIMALARIAL, ANTIAMOEBIC , ANTI-CANCER DRUGS		
2	ANTICOAGULANT AGENTS. HEPARIN WARFARIN , ANTIPLATELET AGENTS, ANTIFIBRINOLYTICS , THROMBOLYTICS		
3	ANTIHISTAMINIC AGENTS , RESPIRATORY DRUGS : Introduction- modulators of bronchial smooth muscle tone and pulmonary vascular smooth muscle tone a. Mucokinetic and mucolytic agents b. Use of bland aerosols in respiratory care Pharmacotherapy of bronchial asthma PROSTAGLANDINS, NSAIDS		
4	Endocrine pharmacology: Thyroid hormones, glucocorticoids, anabolic steroids, calcitonin, insulin and oral hypoglycemic agents.		
5	GIT DRUGS : ANTIDIARRHOEAL DRUGS,		

	LAXATIVES , PHARMAVOTHERAPY OF PEPTIC ULCER		
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**SEMESTER 3
PAPER 3**

BASIC OF CARDIAC CARE TECH. (THEORY)

50 HOURS

S.NO	TOPIC	METHOD	HOURS
1	Applied Anatomy and Physiology - 1. Applied Anatomy a) Structure of the heart and gross anatomy, normal position situs solitus, situs inverses with dextrocardia, situs solitus with dextrocardia, situs inversus with levocardia. b) Systemic and pulmonary circulation, coronary structure, coronary sinus structure and circulation. c) Chest topography - identification of imaginary lines, topographical landmarks over thorax, topography of heart and lungs. d) Surface marking of heart, aorta, pulmonary artery, precordium, heart valves, subclavian. 2. Applied Physiology a) Control of heart rate. b) Concepts of congenital heart (ASD, VSD, PDA, TOF and transpositions). c) Blood circulation, cardiac output, pulmonary circulation, pulmonary oedema d) Concepts of myocardial functions. e) Control of circulation f) Conduction system of the heart		
2	Noninvasive ECG and TMT - ECG a) Technique of ECG recording b) ECG Leads system c) ECG waves - PQRSTU, Osborn wave, delta wave, epsilon wave. d) ECG rates, rhythm, axis calculation, lead positioning.		

	e) Intervals and segments - PR interval, PR segment, ST segment, QT interval, J point and QRS complex. f) ECG anatomy - Chambers enlargement. g) Technical artefacts h) ECG reportingExercise Testing to Diagnose Obstructive Coronary Artery Disease - Rationale and Guidelines, Pretest Probability (true positive, false positive, true negative and false negative ST-Segment Interpretation, Confounders of Stress ECG Interpretation. a) Result Reporting		
3	Noninvasive Echocardiography - a) Introduction and purposes, demonstration of machine parts, b) Basic windows c) Echocardiographic views d) Imaging modes - two-dimensional (2D) imaging, M-mode imaging, and Doppler imaging, color - flow mapping.		
4	Invasive technologies - a) Orientation to the Cath - Lab and biomedical equipments, Introduction and purposes of the Cath - Lab. b) Radiation safety and protocols. c) Vascular access - arterial in femoral, radial and ulnar, venous in femoral. d) Catheterization left heart and right heart, Angiography - Chambers. e) Transducers balancing, measurement of pressures, Calculations of gradients f) Blood flows, cardiac output and Calculations of cardio shunts, resistances. g) Management of patient in the		

	Cath - Lab, coronary angiogram views. h) Prerequisites of cat lab procedures: CBC, RFT, Serology, ECG, Echo, and customised list for all types of procedures. i) Maintaining sterility, PPE - Personnel protective equipments.		
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PRACTICALS

25 HOURS

S.NO	TOPIC	METHOD	HOURS
1	INTERPRETATION OF ABNORMAL & NORMAL ECG P-WAVE , QRS COMPLEX, PR INTERVAL , ST SEGMENT , QT INTERVAL , CARDIAC AXIS (LAD & RAD)		
2	TREADMIL TEST , CARDIAC STRESS TEST , BRUCE PROTOCOL , BICYCLE ERGOMETRY TEST		
3	ECHOCARDIOGRAPHY : BASIC OF CARDIAC WINDOW AND AXIS, M-MODE , 2D THORASTHORACIC ECHO, DOPPLER ECHO : PULSE & CONTINUOUS		
4	CARDIAC CATH LAB: ORIENTATION OF CARDIAC CATH LAB		

SEMESTER 3

PAPER 4

ENVIRONMENTAL SCIENCE

50 HOURS

S.NO	TOPIC	METHOD	HOURS
1	The Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness Natural Resources Renewable and non-renewable resources: Natural resources and associated problems Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems Food resources: World food problems,		

	changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification		
2	Ecosystems Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Biodiversity and its conservation Hot-spots of biodiversity. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity		
3	Environmental Pollution Definition, causes, effects and control measures of:- - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Fireworks, their impacts and hazards Pollution case studies Disaster management: floods, earthquake, cyclone and landslides.		
4	Social Issues and the Environment From Unsustainable to Sustainable development Urban problems related to energy Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Case studies		

	Environmental ethics: Issues and possible solutions. Consumerism and waste products. Environmental Legislation (Acts and Laws) Issues involved in enforcement of environmental legislation Human Population and the Environment Population growth, variation among nations with case studies Population explosion – Family Welfare Programmes and Family Planning Programmes Human Rights. Value Education Women and Child Welfare.		
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B.Sc CARDIAC CARE TECH

SEMESTER 3

PAPER 5

Medical Emergencies & Patient Care

S.NO	TOPIC	METHOD	HOURS
1	Introduction to Emergency Services Organization of Emergency Department, Guidelines in Emergency, Clinical Monitoring, Fluid Therapy and Blood Transfusion, Airway Management, Cardiopulmonary Resuscitation, Principal of Mechanical Ventilation, Injection – An Infusion Method, Acid Base and Electrolyte Imbalance		
2	Handling of Different Emergencies Cardiogenic Shock, Congestive Cardiac Failure, Myocardial Infarction, Head Injuries, Vasovagal Syncope, Seizer, Epilepsy, Conjunctival and Corneal Foreign Body, Foreign Body in Nose & in Ear, Epistaxis, Asthma, COPD, Haemoptysis, Rib Fracture, Tear Gas Exposure, Food Poisoning, Diarrhea, Urine Retention, Blunt Scrotal Trauma, Hypo & Hyperthermia		
3	Concept of health & Illness, Health Determinants, Concept of Patients & Their Types, Patient Centred Care & Fundamentals of Communications, Reporting & Recording of Patients, Rights of Patients , Concepts of Disease & Its Types, General Concept, Care &		

	Prevention of Accident, Trauma & Infections		
4	Patient Care, Associated Units & Departments		

B.Sc CARDIAC CARE TECH.

SEMESTER 4

PAPER 1

Basic Intensive care

Hours 50

Basic Intensive Care

Total Hours 50

Unit I

General ICU Care and Monitoring

1. General care and transport of ICU patient - eye, skin, bladder care, position, airways, drains, catheters. Transport of critically ill patient to and out of ICU, transport of patient with drains, airway, inotropes, mechanical ventilator.
2. Monitoring in critical care: vital signs, drains, ECG, fluid intake & output, invasive hemodynamic and central venous pressure monitoring

Unit II

Infection Control and Nutrition in ICU

3. Infection control in ICU: prevention of cross infection, personal protection, antibiotics and policy.
4. Nutrition and Fluid balance - total parenteral nutrition, nasogastric tube, gastric tube, jejunostomy tube care and feeding, IV Fluids.

Unit III

Systemic Diseases and Care in ICU

5. Cardiac care in ICU: hypertension, hypotension, arrhythmias, cardiac arrest, ACLS
6. Respiratory care in ICU: airway care, tracheostomy care, endotracheal intubation, mechanical ventilation, care of ventilated patient, complications and weaning.
7. Renal failure: types, etiology, complications, corrective measures
8. Hepatic failure: types, etiology, complications, corrective measures

Unit IV

Head Injury and Trauma care in ICU

9. Head injury and Trauma Care: Glasgow coma scale, care of head injury patient, poly trauma patient
10. Blood and blood products transfusion: Transfusion reactions & complications, Massive transfusion

Unit V

Acid base disorders, neonatal ventilation, imaging in ICU

11. Acid-base & electrolyte balance and their correction, fluid, electrolyte, nutrition balance and management.
12. Neonatal mechanical ventilation: intubation and problems inherent to the neonate, basic principles of neonatal ventilation, modes, initiation and maintenance.
13. Miscellaneous: X-rays, ultrasound, chest and limb physical therapy in ICU

Practical:

1. Monitoring of Patients
2. Operating devices, ventilator and monitor settings for different clinical conditions
3. Drugs used in Intensive Care
4. Trouble shooting and maintenance of monitors, equipments and ventilators

B.Sc CARDIAC CARE TECH.

SEMESTER 4

PAPER 2

Basics Cardiac Evaluation

Total Hours 50

S.NO	TOPIC	METHOD	HOURS
1	Heart diseases and related disorders a) Ischaemic heart disease b) Rheumatic heart disease c) Congenital heart disease d) Arrhythmias e) Peripheral vascular disease f) Pericardial disease g) Shock state h) Cardiomyopathy i) Hypertension, diabetes, dyslipidaemias j) Infective endocarditis k) Heart failure l) Pulmonary hypertension and embolism		
2	Cardiovascular investigations: Noninvasive a) ECG - cardiac diagnosis by ECG: Chambers enlargement, arrhythmias, myocardial ischaemia and infarction. b) Echocardiography - cardiac diagnosis: valvular heart diseases, myocardial diseases, ischaemic heart diseases, Cardiomyopathies c) Pulmonary hypertension, infective endocarditis, intracardiac masses. d) Stress test- treadmill test review, pharmacological stress testing. e) 24 hours Holter monitoring f) Ambulatory BP monitoring f) Tilt table test Ankle-Brachial Index		
3	Cardiovascular investigations: Invasive a) Diagnosis of coronary artery disease b) Diagnosis of valvular heart diseases in the cath-lab - stenosis, regurgitation and mixed c) Diagnosis of shunts d) Evaluation of pulmonary hypertension e) Diagnosis of pericardial constriction f) Diagnosis of peripheral and aortic diseases g) Complications of cardiac catheterization h) Complications and management of Contrast		
4	Cardiovascular interventional therapies a) Coronary angioplasty b) Peripheral angioplasty c) Mitral valvoplasty d) Pulmonary and aortic valvoplasty e) Device closures f) Pacemakers g) Pericardiocentesis		

	h) Myocardial biopsy i) Retrieval of foreign bodies j) Clot aspiration		
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PRACTICALS

25 HOURS

S.NO	TOPIC	METHOD	HOURS
1	Non invasive Technology; a) ECG recording basic b) ECHO evaluation basic c) Preparation for treadmill test d) Preparation for 24 hours Holter monitoring e) Preparation for ABPM		
2	Invasive Technology; a) Cardiac Cath right Heart b) Cardiac Cath Left Heart c) Cardiovascular Angiography d) Cardiac Pacing e) Relevant instrumentation in Cath Lab f) Cardiac Emergencies in Cath Lab		

B.Sc. Cardiac Care Technology

Semester IV

Paper 3

Basics of Medical Disorders

Total Hours 50

S.NO	TOPIC	METHOD	HOURS
1	Cardiac and Respiratory diseases 1. Cardio vascular diseases a. Hypertension, Ischemic heart diseases, Myocardial Infarction, arrhythmias b. Heart failure, shock - types, causes 2. Respiratory diseases a. Pneumonia, tuberculosis, b. Chronic obstructive pulmonary disease, asthma c. Pleural effusion, pneumothorax d. Interstitial lung disease		
2	Neurological, Renal, GI and infectious diseases 3. Neurological diseases a. Polio myelitis, Gullian Barre Syndrome, Myasthenia Gravis, epilepsy / seizure disorder, cerebro vascular accident / stroke 4. Renal Diseases		

	a. Acute kidney injury b. Chronic Kidney Disease 5. Gastro intestinal and Liver Diseases a. Gastritis / APD, peptic ulcer b. Acute gastroenteritis c. Hepatitis, Hepatic failure, alcoholic liver disease Infectious diseases: Dengue, malaria, leptospirosis		
3	Blood, fluid, electrolyte and acid base abnormalities 7. Blood loss and Anemia, thrombocytopenia 8. Fluid Electrolyte imbalance and corrective methods 9. Acid Base abnormalities and corrective methods		
4	Pulmonary Oedema, Sepsis and MODS 10. Pulmonary Oedema, Acute Lung Injury and Acute Respiratory Distress Syndrome 11. Sepsis, multi-organ failure, Multi-organ dysfunction syndrome		
5	Health problems in Specific conditions and Toxicology – . Health problems in specific conditions a. Pregnancy - antenatal care, disorders in pregnancy b. Children and new born c. Obesity d. Diabetes mellitus e. HIV infections and AIDS f. Elderly subjects and disability g. Brief mention about endocrine disorders 13. Poisoning and drug over dosing a. Classification of poisons b. Principles of treatment of poisoning and Primary care c. Poisons and drug over dosing requiring ventilation 14. Miscellaneous a. Drowning b. Hanging		

PRACTICAL

25 HOURS

S.NO	TOPIC	METHOD	HOURS
1	History Taking and clinical examination, monitoring of patient.		
2	Therapeutic options for various diseases and conditions		

B.Sc. Cardiac Care Technology

Semester IV

Paper 4-

Coronary Angiography

Total Hours 50

Introduction to coronary angiogram

History of coronary angiography
 Instrumentation in coronary angiography
 Indications for coronary angiography
 Contraindications for coronary angiography
 Procedure
 Approach
 Seldingers technique
 Catheters for coronary angiography
 Views for coronary angiography
 Evaluation of a coronary lesion
 Reporting of coronary angiography
 Decision making on management
 Revascularization PTCA or CABG
 Planning review of protocol
 Post procedure care
 Drugs
 Groin care (femoral approach)
 Wrist care (radial approach)
 Complications and management
 Practical assessment:
 Spotters
 Video Clips
 Demonstration of common disorders

B.Sc. Cardiac Care Technology

Semester V

Paper 1-

Total Hours 50

Cardiac Evaluation

S.NO	TOPIC	METHOD	HOURS
1	Clinical disorders of heart a) Clinical presentation, evaluation and management of acute coronary syndromes b) Clinical presentation, evaluation and management of stable ischemic heart disease c) Hypertension, diagnosis, complications and management d) Cardiac arrhythmia, presentation, diagnosis and management e) Heart failure, classification, diagnosis and management		
2	Drugs and Nutrition in Cardiac Care Drugs acting on cardiac system and emergency cardiovascular drugs a. Antiplatelets drugs b. Antiischemic drugs c. Thrombolytic drugs d. Antiarrhythmic drugs		
3	Patient monitoring in cardiac care		

	Monitoring of a patient with cardiac disease a) Cardiac Rhythm and rate. b) Trans-cutaneous oxygen monitors and Pulse oximeters. c) Invasive hemodynamic monitoring d) Multi parameter monitoring e) ACT monitoring f) Monitoring response to therapy and progression of disease		
4	Cardiovascular investigations: Noninvasive a) ECG - Review of ECG patterns in ischaemic heart diseases, hypertensive heart disease. b) Echocardiography - A review of Evaluation of valvular heart diseases, ischaemic heart diseases, Cardiomyopathies and pericardial diseases c) Pulmonary hypertension, infective endocarditis, intracardiac masses. d) Stress test- treadmill test review, pharmacological stress testing. e) 24 hours Holter monitoring		
5	Cardiovascular investigations: Invasive a) Coronary angiography b) Diagnosis of mitral stenosis, regurgitation and mixed c) Diagnosis of shunts A review d) Diagnosis of peripheral and aortic diseases e) Complications of cardiac catheterization f) Contrast induced nephropathy prevention and management		

PRACTICALS

50HOURS

S.NO	TOPIC	METHOD	HOURS
1	Diagnostic patterns of ECG changes in a patient with chest pain		
2	Diagnostic patterns of ECG changes during stress test		
3	Evaluation of rheumatic mitral stenosis by echocardiography		
4	Evaluation of Pericardial effusion by echocardiography		

B.Sc. Cardiac Care Technology

Semester V

Paper 2-

Basic Cardiac Evaluation and Therapies (Part 1)

Total Hours 50

S.NO	TOPIC	METHOD	HOURS
1	Electrocardiography a) Optimum recording of 12 leads ECG and computerised interpretation b) Trouble shooting of ECG artefacts c) Bradyarrhythmias and tachyarrhythmias. Stress test (tread mill, bicycle and others) a) Indications/ contra indications b) Complications		

2	Echocardiography a) Evaluation of left ventricular studies - 16 segment model b) Evaluation of left ventricular studies - systolic and diastolic functions c) Evaluation of right ventricle		
3	Invasive techniques a) Guide wires b) Diagnostic catheters for coronary angiography c) Diagnostic catheters for carotid, /cerebral angiography d) Diagnostic catheters for renal angiography e) Diagnostic catheters for abdominal vessels		
4	Invasive techniques Procedures a) Carotid and cerebral angiography b) Renal angiography c) Studies of abdominal aorta, mesenteric, iliac and others		
5	Care of patient undergoing vascular procedures a) Indications, contraindications for angiographic studies b) Patient education of the invasive procedures, consent processes and preparation c) Monitoring physiological variables during cath lab procedures d) Post procedure protocols e) Reporting and data management of the cath procedures		

PRACTICAL (STUDENTS PRESENTATION)

50HOURS

S.NO	TOPIC	METHOD	HOURS
1	Right sided ECG chest leads and its importance		
2	Demonstration of TAPSE		
3	Demonstration of estimation of pulmonary artery pressure by echocardiography		
4	Spotters on guide wires and diagnostic catheters		

B.Sc. Cardiac Care Technology

Semester V

Paper 3-

Basic Cardiac Evaluation and Therapies

S.NO	TOPIC	METHOD	HOURS
1	Electrocardiography a) PR interval b) QT interval c) Calculation of heart rate d) Analysis of ST segment e) Artefacts in tread mill ECG		
2	Echocardiography a) Basics of pediatric echocardiography. b) Echocardiography in acute rheumatic fever c) Echocardiography in chronic rheumatic heart disease d) Echocardiography in cardiac tamponade		
3	Invasive techniques a) Cardiac pacing indications		

	b) Cardiac anatomy and its importance in pacing c) Cardiac pacing physiology d) Cardiac pacing temporary e) Cardiac pacing permanent f) Programing of pacemakers g) Common problems associated with pacemakers. h) External cardiac pacingz		
4	Basics of Nuclear cardiology a) Principles of nuclear cardiology b) Tracers used in nuclear cardiology c) Imaging techniques in nuclear cardiology d) Indications of nuclear diagnostic procedures in cardiology		

Practicals/ students presentations - round table

1. Pacemaker interrogation
2. Demonstration of estimation of severe mitral stenosis by echocardiography

B.Sc. Cardiac Care Technology
Semester V
Paper 4-

Skill Enhancement-2 Research
Methodology and Biostatistics Total Hours 50

S.NO	TOPIC	METHOD	HOURS
1	Introduction and Presentation of data Meaning , Branches of Statistics, Uses of statistics in medicine, Basic concepts, Scales of measurement, Collection of data, Presentation of data; Tabulation, Frequency Distribution, Diagrammatic and Graphical Representation of Data.		
2	Measures of central tendency and Measures of Variation Arithmetic Mean (Mean), Median, Mode, Partition values, Range, Interquartile range , Mean Deviation, Standard Deviation, Coefficient of Variation		
3	Probability and standard distributions Definition of some terms commonly encountered in probability, Probability distributions; Binomial distribution, Poisson distribution, Normal distribution, Divergence from normality; Skewness and kurtosis		
4	Census and Sampling Methods Census and sample survey, Common terms used in sampling theory, Non-probability (Non random) Sampling Methods; Convenience sampling, Consecutive Sampling, Quota sampling, Snowball sampling, Judgmental sampling or Purposive sampling, Volunteer sampling, Probability (Random) Sampling methods; Simple random sampling, Systematic Sampling, Stratified Sampling, Cluster sampling, Multi-stage sampling, Sampling error, Non-sampling error		
5	Inferential statistics Parameter and statistic, Estimation of parameters; Point estimation, Interval Estimation, Testing of hypothesis; Null and alternative hypotheses, Type-I and Type-II Errors.		

Hospital Management& medical ethics (Theory)
Semester V
PAPER 5

UNIT-1Introduction to hospital staffing- Hospital staffing, administration, PACS, HIS, RIS, DICOM. Medical records and documentation.

UNIT-2Legal & medical issues- Legal and Ethical issues towards patient rights, patient responsibility, legal concerns, History taking, patient monitoring, inform consent, mal-practice, patient privacy issues. Professional ethics and Code of conduct of radiographer. Medical legal issues (MLC).

UNIT-3Handling of patientsSeriously ill and traumatized patients, visually impaired, hearing and speech impaired patients, mentally impaired patients/ psychologically issues, infectious patients, critical/trauma patients, pregnant patient, patient with implant. Handling of patient with life threatening diseases like HIV, STD, HBsAg, etc.

UNIT-4 Departmental Safety& Infection Control Safety and hazards from material and electricity etc. Biomedical waste management and control. **Infection control**Skin care, donning of gowns, gloves, face masks, head caps, shoe covers. **Vitals signs-** Vital signs. How to measure vital signs. **Body mechanics and transferring& shifting of patient** Draw sheet lift, use of slide boards, wheelchair to couch, couch to wheelchair, couch to table, three men lift and four men lift Orthodox & Austrian method etc.**First aid-** Artificial respiration, hemostasis, first aid techniques, ABCD management.

UNIT-5 Anesthesia-Local anesthesia and general anesthesia, uses in hospital, Facilities regarding general Anesthesia in different department of hospital. Management of adverse.

B.Sc. Cardiac Care Technology
Semester VI

Cardiac Care Technology Clinical

Total Hours 50

Unit I

Documentation and Assessment for Cardiac care

1.Documentation in Non-Invasive technology

- a) ECG
- b) ECHO
- c) TMT

2.Documentation in Invasive technology

- a) Angiography
- b) Interventional procedures

Unit II

Electrocardiography A review

- a) Chamber hypertrophy
- b) Acute coronary syndromes
- c) Bradyarrhythmia
- d) Tachyarrhythmias
- e) Pericardial diseases

Unit III

Ambulatory cardiac technologies

- a) Holter monitoring
- b) Loop recorders
- c) Ambulatory blood pressure recording
- d) Newer technologies for monitoring the patients with heart diseases

Unit IV

Invasive technologies

- a) Coronary angiogram for performing angioplasty
- b) PTCA
- c) Coronary Stents
- d) Optimizing the results of PTCA

Unit V**Invasive technologies**

- a) Intra-aortic balloon pump
- b) Fractional flow reserve

- c) Rotational atherectomy
- d) Intra vascular ultrasound
- e) Optical coherence tomography

Practicals/ students presentations - round table

- a) Demonstration of various ECGs
- b) Demonstration of ambulatory blood pressure hook up and analysis
- c) Demonstration of ambulatory (Holter) ECG hook up and analysis

Paper 2-**Cardiac Care Technology Applied****Total Hours 50**

S.NO	TOPIC	METHOD	HOURS
1	Electrocardiography a) Diagnoses of acute myocardial infarction b) Diagnoses of hyperkalemia c) Diagnoses of WPW syndrome		
2	Echocardiography 1) Congenital heart diseases a) ASD b) VSD c) PDA d) Coarctation of aorta e) Pulmonary and aortic stenosis e) Tetralogy of Fallot f) Others 2) Transesophageal echocardiography 3) Stress echocardiography (pharmacological 3D echocardiography)		
3	Invasive a) Organization of cath lab services b) Data management of cath lab c) Management of intra coronary thrombus d) Management of hypotension e) Management of vasovagal attack f) Management of coronary perforation g) Management of retrieval of dislodged foreign materials in the vessels		
4	Case studies in cardiology a) A case of myocardial infarction with complications b) A case of multivalvular heart disease c) A case of pulmonary thrombo embolism d) A case of infective endocarditis e) A case of mitral valve prolapse f) A case of rheumatic mitral stenosis		

PRACTICAL**50 HOURS**

S.NO	TOPIC	METHOD	HOURS
1	Demonstration of various varieties of myocardial infarction by ECG		

2	Demonstration of ASD various types Demonstration of VSD various types		
3	Demonstration of PDA and Coarctation of aorta		
4	Stent booster technology Foreign body retrieval methods in the cath lab		
5	Balancing transducer Pressure traces, pressure gradients		
6	Steps of PTMC Steps of PTCA		