

# **B.Sc. Perfusion Technology**

**Faculty of Allied  
Health Sciences**

**2019-20**

## Examination Scheme (B.Sc. Perfusion Technology)

<b>Semester- I</b>								
Paper	Subject	Paper Code	Theory Examination		Practical Examination		Total Marks	Credits
			Univ. Exam.	Internal Assessm	Univ. Exam.	Internal Assessm		
1	Anatomy		60	40	30	20	150	4+2
2	Physiology		60	40	30	20	150	4+2
3	Biochemistry		60	40	30	20	150	4+2
4	Communication Skills and Personality Development		60	40	-	-	100	4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>
<b>Semester-II</b>								
1	Pathology		60	40	30	20	150	4+2
2	Microbiology		60	40	30	20	150	4+2
3	Pharmacology		60	40	30	20	150	4+2
4	Fundamentals of Computer Science		60	40	-	-	100	4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>
<b>Semester -III</b>								
1	Applied pathology		60	40	30	20	150	4+2
2	Applied Microbiology		60	40	30	20	150	4+2
3	Introduction to perfusion Technology		60	40	30	20	150	4+2
4	Environmental Science		60	40	-	-	100	4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>
<b>Semester -IV</b>								
1	Basic Patient Care		60	40	30	20	150	4+2
2	Basics of pumps oxygenators and blood components		60	40	30	20	150	4+2
3	Basics of Medical Disorders		60	40	30	20	150	4+2
4	Coronary Angiography		60	40			100	4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>

Semester –V								
Paper	Subject	Paper Code	Theory Examination		Practical Examination		Total Marks	Credits
			Univ. Exam.	Internal Assessm	Univ. Exam.	Internal Assessm		
1	Conduction of cardiopulmonary Bypass & Cannulation technique		60	40	30	20	150	4+2
2	Myocardial protection & drugs used in CPB		60	40	30	20	150	4+2
3	Cardiothoracic & vascular disorders		60	40	30	20	150	4+2
4	Research Methodology and Biostatistics		60	40	-	-	100	4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>
Semester-VI								
1	Effects on various organs during CPB & Introduction to IABP and ECMO		60	40	30	20	150	4+2
2	Special situation in perfusion technology		60	40	30	20	150	4+2
3	Cardiac support devices DHCA & Blood conservation Techniques		60	40	30	20	150	4+2
4	Hospital Management		60	40				4
<b>Total</b>			<b>240</b>	<b>160</b>	<b>90</b>	<b>60</b>	<b>550</b>	<b>22</b>

# **B.Sc. Perfusion Technology**

## **Semester I**

### **Paper 1-**

#### **Anatomy**

Total Hours 50

#### **Unit I**

**Organization of the Human Body**, Introduction to the human body, Definition and subdivisions of anatomy, Anatomical position and terminology, Cell - Definition of a cell, shapes and sizes of cells

- Parts of a cell - cell membranes, cytoplasm, sub cellular organelles.
- Cell Division - Definition and main events in different stages of mitosis and meiosis.

Tissues - Tissues of the body

- Definition and types of tissues
- Characteristics, functions and locations of different types of tissues
- Epithelial tissue - definition, classification with examples
- Glands- classification with examples

#### **Unit II**

##### **Locomotion and Support (General Anatomy)**

###### **1. Cartilage - Types with examples**

**2. Skeletal system**, Skeleton - Definition, axial and appendicular skeleton with names and number of bones, Types of bones. Marking of bones. Functions of bones. Development (types and ossification) and growth of bone. Name, location and general features of the bones of the body.

Joints - Definition and types of joints with examples. Axes and kind of movements possible. Name, location, type, bones forming, ligaments, movements possible and the muscles producing such movements of the joints of the body.

**3. Muscular system** , Parts of the Skeletal muscle. Definition of origin and insertion. Classification of muscular tissue. Compartment muscles of upper limb, lower limb, sternocleidomastoid

#### **Unit III**

##### **Maintenance of the Human Body**

**1. Cardio-vascular system**, Types and general structure of blood vessels. Structure and types of arteries and veins. Structure of capillaries. Shape, size, location, coverings, external and internal features of heart. Structure of heart wall. Conducting system and blood supply of the heart. The systemic arteries and veins. Name, location, branches and main-distribution of major arteries and veins.

2. **Lymphatic system**, Lymph, lymphatic vessels, name, location and features of the lymphoid organs.
3. **Respiratory system**, Names of organs of respiration, Location and features of nose, pharynx, larynx, trachea, bronchi, lungs and pleura.
4. **Digestive system**, Names of organs of digestion. Location and features of mouth, pharynx, esophagus, stomach, small and large intestines. Location and features of salivary glands, pancreas, liver and gall bladder

#### **Unit IV**

1. **Urinary system and Reproductive system**, Names of urinary organs, location and features of kidney, ureter, urinary bladder and urethra, Names of male and female organs of reproduction. Location and features of scrotum, testis, epididymis, vas deferens, seminal vesicle, ejaculatory duct, prostate gland, penis and spermatic cord. Location and features of uterus, uterine tube, ovary & mammary gland.
2. **Development**, Gametes, period of gestation, gametogenesis, structure of sperm and ovum, growth of ovarian follicles. Derivatives of germ layers, placenta

#### **Unit V**

##### **Control Systems of the Body**

1. **Nervous system**, Sub-divisions of the nervous system  
Brain - Sub-divisions, location external features of medulla oblongata, pons, mid-brain, cerebellum and cerebrum. Spinal cord - Location, extent, spinal segments, external features and internal structure. Location and features of thalamus and hypothalamus. Locations and subdivisions of basal ganglia. Meninges and spaces around them. Name and location of ventricles of brain and circulation of cerebrospinal fluid. Blood supply of the brain and spinal cord. Cranial nerves
2. **Sense organs**, Location and features of the nose, tongue, eye, ear and skin
3. **Endocrine system**, Names of the endocrine glands. Location and features of pituitary, thyroid, parathyroid, suprarenal, pancreas, ovaries and testes. Names of hormones produced by each gland.

##### **Practicals:**

1. Demonstration of parts of microscope and its uses
2. Demonstration of skeleton and joint
3. Demonstration of deltoid and gluteus maximus, Cubital fossa
4. Demonstration of heart and its blood supply, demonstration of major arteries of upper limb and lower limb, histology of cardiac muscle and histology of vessels
5. Demonstration of location and parts of lungs, histology of trachea and lungs
6. Demonstration of location of stomach, small and large intestines. Location and features of pancreas, liver and gall bladder

##### **Recommended Books Recent Editions:**

1. Ross and Wilson: Anatomy and Physiology in Health and illness
2. Understanding Human Anatomy and Physiology, William Davis (p) MC Graw Hill

3. Essentials of Human Embryology. Bhatnagar, Orient Blackswan Pvt. Ltd.
4. Anatomy for B.Sc Nursing by Renu Chauhan. Arichal publishing company 2012
5. Hand book of Anatomy BD Chaurasia

**Reference books:**

1. B D Chaurasia: Regional Anatomy. Vol I, II, III 6<sup>th</sup> edition

# **B.Sc. Perfusion Technology**

## **Semester I**

### **Paper 2-**

### **Physiology**

Total Hours 50

#### **Unit -I**

**General physiology and Blood 8 Hrs General Physiology:** Organization of the cell and its function, homeostasis, Transport across cell membrane, Membrane Potentials, Resting Membrane Potential & Action Potential, Body Fluid Compartments - Normal Values

**Blood:** Introduction: composition and function of blood. Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation. Structure, function, concentration, physiological variation, methods of estimation of haemoglobin. White blood cells: production, function, count. Platelets: origin, normal count, morphology & functions. Plasma proteins: types, functions, Haemostasis: definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting - Blood groups: ABO system, Rh system. Blood grouping & typing, cross matching. Rh system: Rh factor, Rh incompatibility. Blood transfusion: indication. transfusion reactions. Anticoagulants: classification, examples and uses. Anaemias: morphological and etiological classification, -Blood indices: CI, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume, normal values.

#### **Unit -II**

##### **Digestive system & Respiratory system**

**10hrs**

**Digestive System,** Physiological anatomy of gastro intestinal tract, functions of digestive system. Salivary glands: structure and functions, deglutition: stages and regulation. Stomach: structure and functions. Gastric secretion: composition function regulation of gastric juice secretion. Pancreas : structure, function, composition of pancreatic juice. Functions of liver. Bile secretion, composition, function. jaundice: types. Functions of gall bladder. Small intestine: functions, digestion, absorption, movements. Large intestine: functions, movements defecation

**Respiratory system:** Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles. Mechanism of normal and rigorous respiration, forces opposing and favoring expansion of the lungs. Intra pulmonary & intrapleural pressure. Surface tension, recoil tendency of the thoracic cage and lungs . Transport of respiratory gases: transport of oxygen & carbon dioxide, oxy haemoglobin dissociation curve, factors affecting it. Lung volumes and capacities - normal values Regulation of respiration: mechanisms of regulation, nervous and chemical regulation, respiratory centre. Applied physiology : hypoxia, cyanosis, dyspnoea, apnoea.

#### **Unit III**

##### **Cardiovascular and Endocrine system**

**Cardiovascular system** Heart: Physiological Anatomy, Nerve supply. Properties of cardiac muscle, cardiac cycle: Conducting System of Heart, Origin and Spread of Cardiac Impulse, Electrocardiogram (ECG) waves and normal duration. Recording Cardiac Cycle: Phases and Volume Changes, Normal heart sounds, areas of auscultation. Pulse: jugular, radial pulse, Cardiac output : definitions of stroke volume, cardiac index, factors Affecting It. measurement of Cardiac output. General principles

of circulation. Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension. Factors affecting it and regulation, Physiological variations & regulation of heart rate. Coronary circulation, Shock

**Endocrine System:** Classification of endocrine glands & Definition of hormone. Pituitary hormones: anterior and posterior pituitary hormones, secretion, functions, Thyroid gland: physiological anatomy, hormone secreted, physiological function, regulation, secretion, disorders (hypo and hyper secretion of hormone). Adrenal cortex: physiological anatomy. cortical hormones, functions and regulation. Adrenal medulla: hormones, regulation and secretion. Functions of adrenaline and nor adrenaline. Hormones of pancreas. Insulin: secretion, regulation, function and action. Diabetes mellitus: regulation of blood glucose level. Parathyroid gland: function, action, regulation of secretion of parathyroid hormone. Calcitonin:

#### Unit -IV

##### Excretory system and Reproductive system

10 hrs

**Excretory System,** Functional anatomy of kidney, Juxta glomerular apparatus: structure and function. Glomerular filtration, Tubular function(reabsorption and secretion), Micturition, innervation of bladder, cystometrogram. Artificial kidney, renal function tests skin and body temperature

**Reproductive system** Male reproductive system: functions of testes, spermatogenesis: Endocrine functions of testes -Female reproductive system: oestrogen, progesteron, menstrual cycle: ovulation, physiological changes during pregnancy, pregnancy tests. Lactation: composition of milk, factors controlling lactation.

**Muscle nerve physiology, Nervous system and Special senses,** properties of neuron and neuroglia. Classification of nerve fibers Classification of muscle, structure of skeletal muscle, Neuromuscular junction. Transmission across nmj Excitation contraction coupling. muscle tone, fatigue, rigor mortis.

**Nervous system,** Organisation of nervous system, Synapse: structure, types, properties., Receptors: definition, classification, properties. Sensations-pain, Organization Spinal cord. Ascending tracts, descending tracts. Reflex : definition reflex arc, clinical classification of reflexes : Babinski's sign. Hypothalamus- functions Cerebral cortex lobes - functions, Cerebellum- functions, Basal ganglia functions. Cerebro Spinal Fluid (CSF) : formation, circulation & reabsorption . composition and functions. Lumbar puncture. Autonomic Nervous System: Sympathetic and parasympathetic distribution

**Special senses** Vision: structure of eye, function of different parts. Structure of retina. visual pathway, errors of refraction, Hearing: structure and functions of ear. Taste : taste buds and taste pathway. Olfaction : receptors, pathway.

##### Practicals:

1. Haemoglobinometry.
2. Haemocytometry
3. Total leucocyte count.
4. Total Red blood cell count.
5. Determination of blood groups.
6. Differential WBC count.
7. Determination of clotting time, bleeding time.
8. Erythrocyte sedimentation rate (ESR). Determination of packed cell Volume,

Calculation of Blood indices: CI, MCH, MCV, MCHC.

9. Blood pressure recording.

10. Spirometry, Artificial Respiration

**Recommended Books Recent Editions**

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy, 1st Ed. Arya Publication.
2. Dr. Venkatesh.D and Dr. Sudhakar H.S.Basic of Medical Physiology, 2nd Ed., Wolter-Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology 6th Ed. New Central Book

# **B.Sc. Perfusion Technology**

## **Semester I**

### **Paper 3-**

#### **Biochemistry**

Total Hours 50

#### **Unit I**

**Chemistry of Cell & Chemistry of Carbohydrates, Proteins, Lipids & Nucleotides**-Cell-Structure & Function of Cell Membrane, Subcellular Organelles and their Functions. Carbohydrates- Definition, Classification & Biological importance of carbohydrates, Derivatives of Monosaccharides. Proteins- Definition & Classification of amino acids & Proteins, Biologically important peptides Plasma proteins, Immunoglobulins. Lipids- Definition, Classification & Biological importance and Functions of Lipids. Structure and functions of Cholesterol, types and functions of Lipoproteins. Nucleotides- Structure and Functions of DNA & RNA. Biologically important nucleotides.

#### **Unit II**

**Enzymes & Acid base balance**, Enzymes- Definition and Classification. Factors affecting enzyme activity. Coenzymes and Cofactors. Enzyme inhibition & Regulation of enzyme activity, Acid Base balance- Acids, Bases & Body Buffers, Regulation of pH, Acid base disorders.

#### **Unit III**

**Vitamins & Minerals**, Vitamins-Classification, Sources, RDA, Functions( in brief), deficiency manifestations and hypervitaminosis. Minerals- Classification, Sources, RDA, Functions (in Brief), deficiency manifestations of the following: calcium, phosphorous, iron, copper, iodine, zinc, fluoride, magnesium, selenium, sodium, potassium and chloride.

#### **Unit IV**

**Nutrition, Blood chemistry & Urine Chemistry** Nutrition- Nutrients, Calorific value of food, BMR, SDA, respiratory quotient and its applications, Balanced diet based on age, sex and activity, biological value of proteins, nitrogen balance, Protein energy malnutrition, Total parenteral nutrition, dietary fibers. Blood chemistry- Biochemical components & their reference ranges in normal & diseased states. Urine chemistry- Biochemical components & their reference ranges in normal & diseased states.

#### **Unit V**

##### **Clinical Biochemistry-**

Specimen Collection- Blood, Urine and Body fluids. Preanalytical, analytical and postanalytical errors Clinical Biochemistry- Parameters to diagnose Diabetes & Cardiovascular diseases. Diagnostic enzymology, Assessment of arterial Blood gas status and electrolyte balance, Point of Care Testing. Renal Function tests( in brief), Liver function tests(in brief), Biomedical Waste Management.

##### **Practicals:**

1. General Reactions of Carbohydrates.
2. Color reactions of Proteins.
3. Reactions of Non Protein nitrogenous substances.
4. Demonstration of pH meter, Colorimeter and spectrophotometer.
5. Demonstration of Chromatography and Electrophoresis.

**Recommended books Recent edition**

1. Textbook of Biochemistry -D.M.Vasudevan
2. Biochemistry -Pankaja Naik
3. Clinical Biochemistry-Principles and Practice-Praful.B.Godkar
4. Textbook of Biochemistry-Chatterjea and Shinde
5. Textbook of Clinical Chemistry-Norbert W Teitz

# **B.Sc. Perfusion Technology**

## **Semester I**

### **Paper 4-**

**Communication skill and personality development** Total Hours 50

#### **UNIT 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.

#### **UNIT 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

#### **UNIT 3**

**Reading Comprehension**, Simple narration and Stories, Newspaper and articles clippings, Sentence types, Note Making, Paragraph Writing, Comprehension, Report Writing: types, characteristics.

#### **UNIT 4**

**Pronunciation**, Pronunciation, Syllable and Stress, Intonation and Modulation.

#### **UNIT 5**

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

# **B.Sc. Perfusion Technology**

## **Semester II**

### **Paper 1-**

### **Pathology**

Total Hours 50

#### **Unit I**

**Introduction- & scope of pathology** Cell injury and Cellular adaptations - Normal cell, Cell injury - types, etiology, morphology, Cell death-autolysis, necrosis, apoptosis, Cellular adaptations-atrophy, hypertrophy, hyperplasia, metaplasia. Inflammation-Introduction, 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.

#### **Unit II**

**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 anemia: causes, labfindings, haemolytic anemias: definition. Causes, classification and labfindings.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.

#### **Unit- III**

**Basic Hematological Techniques** Characteristics of good technician, Blood collection - methods (capillary blood, venipuncture, arterial puncture) complications, patient after care, 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.

#### **Unit IV**

**Transfusion Medicine** Selection of donor, blood grouping, Rh typing, cross matching, storage, transfusion transmitted diseases, transfusion reactions, components - types, indications.

#### **Unit V**

**Clinical Pathology** Introduction to 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 - rotheras test, bile pigments fouchet method, bile salt - hays method, blood - benzydine test, urobilinogen and porphobilinogen - ehrlich

aldehyde and schwartz test, bence jones protein., microscopy. Examination of cerebrospinal fluid - physical examination, chemical examination, microscopic examination, examination of body fluids (pleural, pericardial and peritoneal), physical examination, chemical examination, microscopic examination, sputum examination.

**Practicals:**

- Laboratory organization-
- Reception of specimen, dispatch of reports, records keeping, coding of cases.
- Laboratory safety guidelines.
- SI units and conventional units in hospital laboratory.
- Haematology techniques
- Basic requirements for hematology laboratory
- Glasswares for hematology
- Equipments for haematology.
- Anticoagulant vials
- Complete blood counts.

**Recommended Books:**

1. Text book of Pathology Harsha Mmohan Jaypee Brothers, New Delhi.
2. Practical Pathology P. Chakraborty, Gargi Chakarborty New Central book agency, Kolkata.
3. Text book of Haematology Dr Tejinder Singh Arya Publications, Sirmour (H P)
4. Text book of Medical Laboratory Technology Praful Godkar Bhalani Publications house, Mumbai.
5. Textbook of Medical Laboratory Technology Ramanik Sood.

# **B.Sc. Perfusion Technology**

## **Semester II**

### **Paper 2-**

#### **Microbiology**

Total Hours 50

#### **Unit - I**

**General Microbiology:** Morphology and classification of microorganisms. Growth, nutrition and multiplication of bacteria Sterilization and Disinfection - Principles and use of equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants 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.

#### **Unit - II**

**Bacteriology:** Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium diphtheriae, Clostridia, Enterobacteriaceae - Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes

#### **Unit III**

**Mycobacteriology & Parasitology:** Mycobacteria- classification, pathogenesis, lab diagnosis and prevention, Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

#### **Unit IV**

**Mycology:** Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium)

#### **Unit V**

**Virology,** General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.

#### **Practicals:**

1. Compound microscope and its application in microbiology.
2. Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, Mac conkey medium, L J media, Robertson cooked meat media, MacConkey agar with LF & NLF, Nutrient agar with staph colonies. Anaerobic culture, Methods and Antibiotic susceptibility test.
3. Demonstration of common serological tests: Widal, VDRL, ASLO, CRP, RF, Rapid tests for HIV, Hbsag and HCV.
4. Grams staining.
5. Acid fast staining.

6. Principles and practice of Biomedical waste management.
7. Stool Microscopy.

**Recommended Books Recent Editions.**

1. Anathanarayana & Panikar: Medical Microbiology - Revised 8th edition University Press.
2. Parasitology by Chatterjee - Interpretation to Clinical Medicine.
3. Textbook of Microbiology - Baveja, 5th edition, Arya Publications
4. Textbook for Laboratory technicians by RamnikSood. Jaypee Publishers
5. Textbook of Parasitology by Paniker. 7th edition

# B.Sc. Perfusion Technology

## Semester II

### Paper 3-

### Pharmacology

Total Hours 50

#### Unit I

**General Pharmacology, ANS, PNS.** Sources of Drugs Route of drug administration Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion) Pharmacodynamics (Mechanisms of action) Adverse drug reactions, ANS : ADRENERGIC Drugs - Adrenaline, Noradrenaline, Ephedrine, Dopamine, Dobutamine Anti adrenergic - Phentolamine, Phenoxybenzamine, Prazocin, Tamsulosin, Propranolol, Atenolol, Carvedilol Cholinergic drugs-Acetyl choline, Pilocarpine, Neostigmine, Organophosphorous compounds Anti cholinergic agents-Atropine, Glycopyrrolate, Ipratropium Bromide, Dicyclomine

#### Unit II

**PNS, CVS, Renal System,** Skeletal muscle relaxants - D Tubocurarine, Succinyl choline, Diazepam, Dantrolene Local anaesthetics - lignocaine, la + vasoconstrictor CVS - ionotropic agents - Digoxin, Antianginal drugs - GTN, Antihypertensives - Betablockers (Propranolol, Atenolol, carvedilol), CCBs (Nifedine), Diuretics (Thiazide, Furosemide, ace inhibitors, ARBs, Clonidine Drugs used in treatment of different types of shock, Plasma expanders Renal system - Diuretics Furosemide, Thiazide, Spiranolactone Antidiuretics - Vasopressin

#### Unit III

**CNS, Blood** CNS - general Anaesthetics - nitrous oxide, Halothane, iv anaesthetics Sedative hypnotics - diazepam, barbiturates, zolpidem, Antiepileptics - Phenytoin, carbamazepine, phenobarbitone, valproate, Opioid analgesics - morphine, pethidine, codeine, NSAIDS - Aspirin, Diclofenacibuprofen, Selective COX2 inhibitors, Respiratory system-treatment of cough And Bronchial asthma, Blood - Hematinics, Anticoagulants - Warfarin, Heparin, Thrombolytics & Antiplatelet drugs - streptokinase,/ aspirin, clopidogrel

#### Unit IV

**GIT, Chemotherapy,** GIT - drugs used in peptic ulcer - ppi, H2 blockers, Antacids Antiemetics - Metaclopramide, Domperidone, Ondansetron Purgatives & Laxatives-bran, ispaghula, Lactulose, Bisacodyl & senna Drugs used in Diarrhoea- ORS, Super ORS, Antimotility drugs (loperamide, diphenoxylate), Chemotherapy - general considerations MOA, Resistance, Prophylaxis Sulfonamides, cotrimoxazoles, Quinolones Tetracyclines, chloramphenicol, Betalactam antibiotics

#### Unit V

**Chemotherapy, Hormones.** Aminoglycosides, Macrolides, other antibiotics (vancomycin, linezolid) & treatment of UTI Antifungal (clotrimazole, flucanazole), Antiviral (Acyclovir, Few drugs used in HAART.), Cancer chemotherapy (names, common Adverse effects, general principles in the treatment of cancer) Hormones - Corticosteroids its uses and adverse effects, Treatment of Diabetes mellitus(insulin, Metformin, Glibenclamide)

Practicals Syllabus : -

- Dosage forms
- Solid Dosage forms
- Liquid Dosage forms

- Gaseous Dosage forms
- Oral route
- Parenteral routes
  
- Novel routes
- Fixed dose combination - Amoxicillin + clavulanic acid - cotrimoxazole,
- Lignocaine + Adrenaline
- Drug stations - Adrenaline, dopamine, Dobutamine)
- Drug stations - Corticosteroids (hydrocortisone, prednisalone, inhalational steroids)
- Drug stations - common antibiotics (amoxicillin, ciprofloxacin, Azithromycin, Metronidazole, Cephalosporins)
- Drug stations - Insulin preparations
- Instrument & devices (Nasogastric tube, laryngoscope, Different Catheters, nebulizers, Inhalers, Rotahalers)

**Recommended Books Recent Editions.**

1. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, Emca House, 23/23, Bansari Road, Daryaganj, New Delhi.
2. Padmaja Udaykumar -Pharmacology for Allied Sciences.
3. R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th edition, Single Volume, M/s Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.

**B.Sc. Perfusion Technology**  
**Semester II**  
**Paper 4-**  
**Fundamentals of Computer Science**      Total Hours 50

**Unit 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 1<sup>st</sup> generation to fourth generation. Some description about fifth generation.

Data representation in memory.

**Unit 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.

**Unit 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.)

**Unit 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. Perfusion Technology**

### **Semester III**

#### **Paper 1-**

#### **Applied Pathology**

Total Hours 50

#### **UNIT I**

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

#### **UNIT II**

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.

#### **UNIT III**

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

#### **UNIT IV**

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

#### **UNIT V**

Clinical manifestations of renal diseases, Glomerular lesions in systemic diseases- diabetes, amyloidosis and systemic lupus erythematosus, Pericardial and pleural effusions- causes and microscopy.

#### **Practical:**

1. Urine examination: physical, chemical, microscopy
2. Blood grouping & Rh typing
3. Hemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR)
4. Charts
5. Specimens
  - \* Atherosclerosis
  - \* Pneumonia
  - \* Tuberculosis
  - \* Infarct - lung
  - \* Contracted kidney
  - \* Hydronephrosis

**Reference Books (latest edition)**

- 1 Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
- 2 Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
- 3 Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata
- 4 Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)
- 5 Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai
- 6 Text Book of Medical Laboratory Technology RamanikSood
- 7 Practical Haematology Sir John Dacie Churchill Livingstone, London.

# **B.Sc. Perfusion Technology**

## **Semester III**

### **Paper 2-**

#### **Applied Microbiology**

Total Hours 50

#### **Unit I.**

**Sterilization and disinfection**, Sterilization and disinfection - classification, principle, methods, Central sterile supply department

#### **Unit II.**

**Importance of sterilization and disinfection**, Disinfection of instruments used in patient care, Disinfection of patient care unit, Infection control measures for ICUs

#### **Unit III.**

**Health care associated infections**, Surgical site infections, Urinary tract infections, Ventilator associated pneumonia, Catheter associated blood stream infections, Antibiotic associated diarrhea.

#### **Unit IV.**

**Drug resistant bacteria**, MRSA, VRE, Drug resistant Gram negative bacteria

#### **Unit V.**

**Occupationally acquired infections and its prevention**, Respiratory route - Tuberculosis, Varicella zoster virus, Influenza, RSV, Blood borne route - HIV, HBV, HCV, CMV, Ebola, Orofecal route - Salmonella, Hepatitis A, Direct contact - Herpes virus

#### **Practicals -**

1. Sterilization and disinfection practices in tertiary care hospital
2. Quality control of sterilization and Interpretation of results of sterility testing
3. Collection of specimen from outpatient units, inpatient units, minor operation theatre and major operation theatre for sterility testing.
4. Preparation of materials for autoclaving - packing of materials, loading, holding time and unloading
5. Disinfection of wards, operation theatres and laboratory and air sampling methods

#### **Recommended Books:**

1. Textbook of Microbiology by Ananthnarayan and paniker
2. Textbook of hospital infection control by Purvamathur
3. Textbook of Microbiology by Baveja
4. Hospital infection control by Mayhall

**B.Sc. Perfusion Technology**  
**Semester III**  
**Paper 3-**  
**Introduction to Perfusion Technology** Total Hours 50

**UNIT I**

**History and evolution of Cardiac Surgery & Cardiopulmonary Bypass.** Dr John Gibbons Heart Lung Machine, Cross circulation (Gross Well) technique Hypothermic Cardiac Surgery, Advent of Cardiopulmonary Bypass

**UNIT II**

**Basic Principles of:** Extracorporeal Circulation, Extracorporeal gas exchange Biocompatible Materials used in Perfusion Aseptic techniques and Sterility in perfusion.

**UNIT III**

**Basics of diagnostic techniques,** Chest X-ray, ECG, Echo, Coronary Angiography, Nuclear Cardiology, Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile, Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes

**UNIT IV**

**Basic components used in CPB-** Heart lung machine, Oxygenator, Heater cooler unit Blood cardioplegia device ACT Machine, Basics of general Anaesthesia., Types of anaesthesia - general anaesthesia, regional anaesthesia ,local anaesthesia Drugs in anaesthesia- Propofol, Thiopentone, Keatamine, Etomidate, Muscle relaxants- Vercuronium, Pancuronium, Atracurium, Benzodiazepine- Midazolam, Diazepam, Inhalations agents - Halothane, Sevoflurane, Isoflurane

**UNIT V**

**Basics of monitoring,** Setting up of ECG machine, Pressure transducer, Syringe and peristaltic pumps, Anaesthesia Monitors, Pulse oximeters, Temperature probes and Thermoregulatory monitoring, Defibrillators, Fibrillators, ACT (Activated Clotting Time)

**Practical syllabus**

- 1 Chest X-ray
- 2 ECG
- 3 Echo
- 4 Coronary Angiography
- 5 Nuclear Cardiology, ACT Machine
- 6 Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile.

Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes, Heart lung machine

- Oxygenator
- Heater cooler unit
- Blood cardioplegia device
- ACT Machine
- Setting up of ECG machine

- Pressure transducer
- Syringe and peristaltic pumps
- Anaesthesia Monitors
- Pulse oximeters
- Temperature probes and Thermoregulatory monitoring
- Defibrillators
- Fibrillators
- ACT Activated Clotting Time

**Reference Books**

1. Cardiac surgery in the Adult- Lawrence H. Cohn.
2. Paediatric cardiac surgery, Constantine Mauraoudis, Isbn 978-1-4051-9652-9.
3. General Thoracic Surgery. Thomas W. Shields (2 Vols) -isbn-13-978-078-779821, Isbn-10-0781779820.
4. Principles and Practice of Medicine.(for Neurology, Nephrology, Cardiology, Gastroenterology, Pulmonology). Davidsons

# **B.Sc. Perfusion Technology**

## **Semester III**

### **Paper 4-**

#### **Environmental Science**

Hours 50

#### **Unit 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.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

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.

#### **Unit 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

**Unit 3:**

Environmental Pollution

Definition, causes, effects and control measures of:-

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. 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.

**Unit 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.

# **B.Sc. Perfusion Technology**

## **Semester IV**

### **Paper 1-**

#### **Basic Patient care**

Total Hours 50

#### **Unit I**

Introduction, Communication and Documentation - **Introduction to Patient Care:** Principles of patient care. Types of patients (gender, age, diseases, severity of illness, triage). **Communication & Documentation:** Communication with doctors, colleagues and other staffs. Non-verbal communication, Inter-personnel relationships. patient contact techniques, communication with patients and their relatives, **Documentation:** Importance of documentation, initial and follow up notes; documentation of therapy, procedures and communication

#### **Unit II**

Universal Precautions and Infection Control - **Universal Precautions and Infection Control:** Hand washing and hygiene, Injuries and Personal protection, Insulation and safety procedures, Aseptic techniques, sterilization and disinfection, Disinfection and Sterilization of devices and equipment, Central sterilization and supply department, Biomedical Medical waste management

#### **Unit III**

Medication Administration and Transport of patient -**Medication Administration:** Oral/Parenteral route, Parenteral medication administration: Intra venous, intra muscular, sub-cutaneous, intra dermal routes, Intra venous Infusion, Aerosol medication administration, Oxygen therapy, Intravenous fluids, Blood and blood component transfusion. **Position and Transport of patient:** Patient position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bed making, rest and sleep. Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheel chair, transferring from bed to stretcher. Transport of ill patients (inotropes, intubated / ventilated patients)

#### **Unit IV**

**Bedside care and monitoring-Bedside care:** Methods of giving nourishment: feeding, tube feeding, drips, transfusion. Recording of pulse, blood pressure, respiration, saturation and temperature. Bed side management: giving and taking bed pan, urine container. Observation of stools, urine, sputum, drains. Use and care of catheters and rubber goods. Care of immobile/bed ridden patients, bed sore and aspiration prevention **Monitoring of Patient:** Pulse, ECG (Cardiac Monitor), Oxygen Saturation, Blood Pressure, Respiration, Multi parameter monitors, Capnography and End Tidal CO<sub>2</sub> (ETCO<sub>2</sub>), Hydration, intake and output monitoring Monitoring ventilator parameters: Respiratory Rate, Volumes, Pressures, Compliance, Resistance.

#### **Unit V**

**Dressing and wound care:** Bandaging: basic turns, bandaging extremities, triangular bandages and their application. Surgical dressing: observation of dressing procedures. Suture materials and suturing techniques, Splinting. Basic care of patient with burns.

## **First Aid and Basic Life Support (BLS)**

### **Practical:**

#### **1. Demonstration of Patient care Procedures:**

- a) Positioning of patient, transport of the patient, Dressing and Bandaging, Care of inter costal drain tube, Insertion of naso-gastric tube and feeding
- b) Phlebotomy and obtaining blood samples, Arterial Blood sampling for ABG
- c) Injections: intra muscular, intra venous, sub cutaneous, intra dermal
- d) Insertion of intra venous catheter and infusion of medications, blood transfusion
- e) Recording of ECG and monitoring of patient
- f) Oxygen therapy: oxygen cannula, masks. Aerosol therapy: nebulization, inhalers
- g) Suctioning and care of artificial airway
- h) Insertion of urinary bladder catheter

#### **2. Uses, principles, advantages and disadvantages of instruments and Devices in patient care**

#### **3. First aid and Basic Life Support (BLS)**

### **Reference Books:**

1. Principles and practice of Nursing - Sr Nancy
2. Introduction to Critical Care Nursing - Mary Lou Sole
3. First Aid - Redcross society guidelines
4. Basic Life Support (BLS) - American Heart Association guidelines

# **B.Sc. Perfusion Technology**

## **Semester IV**

### **Paper 2-**

#### **Basics of Pumps, Oxygenators and Blood Components 50Hrs.**

##### **UNIT I**

**Oxygenators**-History of Oxygenators, Types of Oxygenators, Disc and Screen Oxygenators, Bubble Oxygenators, Membrane Oxygenators, Design & function of various Oxygenators.

##### **UNIT II**

**Pumps**- History of Pumps, Characteristics of an Ideal Pump, Types of Pumps Roller pumps, Centrifugal pumps, Peristaltic pumps, Design & function of Roller pumps, Design & function of Centrifugal pumps.

##### **UNIT III**

**Filters**-Arterial filters, Cardiotomy filters, Gas line filters, Leucocyte filters, Types of tubing's used in CPB, Heat Exchangers.

##### **UNIT IV**

**Blood components**-Blood grouping and Cross Matching, PRBC, Whole blood, Platelets, FFP, Cryoprecipitate

##### **UNIT V**

**Coagulation system**-Platelet Disorders- Thrombocytopenia, Thrombophilia, Coagulation pathway disorders - Von willibrands diseases Haemophilia, DIC- Disseminated intravascular coagulation, Fibrinolytic system and its disorders.

##### **Practical Syllabus**

Design & function of Roller pumps

- \* Arterial filters
- \* Cardiotomy filters
- \* Gas line filters
- \* Leucocyte filters

Types of tubing's used in CPB

Heat Exchangers

##### **Recommended Books**

- 1 Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)
- 2 Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
- 3 Cardiopulmonary Bypass Cambridge University- Sunit Ghosh , Florian Falter, Davis J.Cook (Editors)
- 4 Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP,FPP (editor)
- 5 ECMO, Extracorporeal cardiopulmonary Support in Critical Car, Red Book, Gail M.Annich (author) Publisher: Extracorporeal Life Support Organization.

# **B.Sc. Perfusion Technology**

## **Semester IV**

### **Paper 3-**

#### **Basics of Medical Disorders**

Total Hours 50

#### **Unit I**

**Cardiac and Respiratory diseases** -Cardio vascular diseases-Hypertension, Ischemic heart diseases, Myocardial Infarction, arrhythmias, Heart failure, shock - types, causes, Respiratory diseases, Pneumonia, tuberculosis, Chronic obstructive pulmonary disease, asthma, Pleural effusion, pneumothorax, Interstitial lung disease

#### **Unit II**

**Neurological, Renal, GI and infectious diseases** -Neurological diseases-Polio myelitis, Gullian Barre Syndrome, Myasthenia Gravis, epilepsy / seizure disorder, cerebro vascular accident / stroke Renal Diseases-Acute kidney injury, Chronic Kidney Disease, Gastro intestinal and Liver Diseases, Gastritis / APD, peptic ulcer, Acute gastroenteritis, Hepatitis, Hepatic failure, alcoholic liver disease, Infectious diseases: Dengue, malaria, leptospirosis

#### **Unit III**

**Blood, fluid, electrolyte and acid base abnormalities-** Blood loss and Anemia, thrombocytopenia, Fluid Electrolyte imbalance and corrective methods, Acid Base abnormalities and corrective methods.

#### **Unit IV**

**Pulmonary Oedema, Sepsis and MODS** - Pulmonary Oedema, Acute Lung Injury and Acute Respiratory Distress Syndrome Sepsis, multi-organ failure, Multi-organ dysfunction syndrome.

#### **Unit V**

**Health problems in Specific conditions and Toxicology** - Health problems in specific conditions-Pregnancy - antenatal care, disorders in pregnancy-Children and new born, Obesity, Diabetes mellitus, HIV infections and AIDS, Elderly subjects and disability, Brief mention about endocrine disorders, Poisoning and drug over dosing-Classification of poisons, Principles of treatment of poisoning and Primary care, Poisons and drug over dosing requiring ventilation, Miscellaneous-Drowning, Hanging

#### **Practical:**

1. History Taking and clinical examination, monitoring of patient.
2. Therapeutic options for various diseases and conditions

#### **Reference Books:**

Davidson's Principles and Practice of Medicine - Elsevier Publications

Harrison's Principle of Internal Medicine

# **B.Sc. Perfusion Technology**

**Semester IV**

**Paper 4-**

**Coronary Angiography**

**Total Hours 50**

**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. Perfusion Technology**

## **Semester V**

### **Paper 1-**

#### **Conduct of Cardiopulmonary Bypass and Cannulation Techniques**

Total Hours 50

#### **UNIT I**

**Cardiopulmonary Bypass Circuitry:** Adult circuit, Paediatric circuit, Neonatal circuit

#### **UNIT II**

**Cannulation Techniques** Arterial cannulation- Aortic, femoral, iliac, Venous cannulation- SVC, IVC, RA, femoral vein, Cardioplegia cannulation- Antegrade, Retrograde, Osteal.

#### **UNIT III**

##### **Priming solutions and Haemodilution in CPB**

Crystalloids, Ringer lactate, Normal saline, Plasmalyte A, Dextrose, Colloids – Hetastarch Albumin, FFP. Additional drugs used in them - Mannitol, Heparin, Bicarbonate.

#### **UNIT IV**

**Conduct of CPB-**Chart Review and selection of Equipments, Assembling the circuit: Priming and Setting occlusion, Initiation of CPB and Gas management.

Venting of the Heart and Cardiotomy Suction, Pre-CPB checklist, Pre weaning off, bypass checklist, Cardioplegia dosage and management, ABG and ACT management, Adequacy of Perfusion, Weaning From CPB.

#### **UNIT V**

##### **Renal System - Presentation, Diagnosis and Management**

ARF Acute renal failure, CRF Chronic renal failure, Why and when do we do, Haemodialysis, Types of Dialysis, CNS Aetiology, presentation and diagnosis of, Hemiplegia, Paraplegia, Stroke, Cerebral haemorrhage.

### **Practical**

- 1 Adult circuit
- 2 Paediatric circuit
- 3 Neonatal circuit
- 4 Arterial cannulation- Aortic, femoral, iliac
- 5 Venous cannulation- SVC, IVC, RA, femoral vein
- 6 Cardioplegia cannulation- Antegrade, Retrograde, Osteal
- 7 Assembling the circuit:
- 8 Priming and Setting occlusion
- 9 Initiation of CPB and Gas management.
- 10 Venting of the Heart and Cardiotomy Suction

11 Cardioplegia dosage and management  
12 ABG and ACT management  
13 Adequacy of Perfusion  
Pre-CPB checklist  
Pre weaning off bypass checklist

**B.Sc. Perfusion Technology**  
**Semester V**  
**Paper 2-**  
**Myocardial Protection and drugs used in CPB**

Total Hours 50

**UNIT 1**

**Myocardial protection**

Crystalloid Cardioplegia - St Thomas solution, Del Nido solution, Custodiol HTK solution - Histidine-Tryptophan-Ketoglutarate Blood cardioplegia delivery Devices-MPS myocardial protection system, Cardioplegia reservoir.

**UNIT II**

Drugs used in CPB: Vasodilators- Sodium Nitroprusside, Nitroglycerine, Vasoconstrictors- Phenylephrine, Anti Arrhythmics- Amiodarone, Magnesium, Lignocaine Diuretic- Frusemide, Mannitol. Anticoagulants- Heparin, Low molecular Weight heparin, Dabagantrin Argatroban, Protamine, Steroids- Dexamethasone.

**UNIT III**

Coagulation management during CPB and its reversal Heparin Pharmacology Heparin Dosing And Monitoring Heparin Resistance Alternatives To Unfractionated Heparin – Heparin Induced Thrombocytopenia Protamine Pharmacology Protamine reaction Temperature management during CPB Temperature monitoring sites Types of hypothermia Temperature gradient.

**UNIT IV**

**Inhalation agents-** Sevoflurane, Isoflurane, Analgesics- Fentanyl, Morphine, Sedatives- Midazolam, Thiopentone, Antiplatelets- Aspirin, Clopidogrel, Ticlopidine, Prasugrel.

**UNIT V**

Sodium Bicarbonate, Potassium Chloride, Heparin and its alternatives- Bivalirudin, Argatroban, Lepirudin Inotropes- Adrenaline, Noradrenaline, Dopamine, Dobutamine, Milrinone, Vasopressin, Levosimendan.

**Practical:**

St Thomas solution, Del Nido solution, Custodiol HTK solution -Histidine-Tryptophan-Ketoglutarate

MPS myocardial protection system, Cardioplegia reservoir, Vasodilators- Sodium Nitroprusside, Nitroglycerine, Vasoconstrictors- Phenylephrine, Anti Arrhythmics- Amiodarone, Magnesium, Lignocaine Diuretic- Frusemide, Mannitol Anticoagulants- Heparin, Low molecular Weight heparin

Protamine Steroids- Dexamethasone

Sodium Bicarbonate, Potassium Chloride, Heparin and its alternatives- Bivalirudin, Argatroban, Adrenaline, Noradrenaline, Dopamine, Dobutamine, Milrinone, Vasopressin, Levosimendan

**B.Sc. Perfusion Technology**  
**Semester V**  
**Paper 3-**  
**Cardiac, Thoracic and Vascular Surgical**  
**Disorders** Total Hours 50

**UNIT I**

IHD (Ischaemic Heart Disease), ACS - angina types - typical, atypical, STEMI, NSTEMI, MI, Cardiomyopathy-Types, presentation, diagnosis and management of Presentation, Diagnosis and Management of Left ventricular failure, Right ventricular failure.

**UNIT II**

Rheumatic Heart Disease-Causes, presentation, diagnosis and management of Mitral stenosis, Mitral regurgitation, Aortic regurgitation, Aortic stenosis, Tricuspid, regurgitation, Tricuspid stenosis.

**UNIT III**

Congenital Heart Disease, presentation, diagnosis and management of, Atrial septal defect, VSD, PDA, TOF, TGA, TAPVC, Coarctation of aorta.

**UNIT IV**

Vascular Diseases-Classification, presentation, diagnosis and management of Aneurysms and dissections, Ascending aorta, Arch of aorta, Descending thoracic aorta.

**UNIT V**

Respiratory System, Presentation, Diagnosis and Management, Chronic obstructive airway diseases, Bronchial asthma, Pneumonia, H<sub>1</sub>N<sub>1</sub>, Pneumothorax, Haemothorax, Basics of PFT and its interpretation

**Practicals syllabus**, Case scenarios of adult heart disease, congenital heart disease and thoracic vascular disease and lung diseases mentioned in the above units.

**Practicals**, Identify and Discuss - CXR, CT thorax, angiogram, CT angiogram and PFT and ECHO findings of the above diseases

**Recommended Books**

- 1 Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)
- 2 Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
- 3 Cardiopulmonary Bypass Cambridge University- Sunit Ghosh , Florian Falter, Davis J.Cook (Editors)
- 4 Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP, FPP (editor)

**B.Sc. Perfusion Technology**  
**Semester V**  
**Paper 4-**  
**Skill Enhancement-2**  
**Research Methodology and Biostatistics**  
Total Hours 50

**Unit I.**

**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.

**Unit II.**

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.

**Unit III**

**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

**Unit IV**

**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.

**Unit V**

**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.

**B.Sc. Perfusion Technology**  
**Semester VI**  
**Paper 1-**  
**Effects on Various Organs during CPB and**  
**Introduction to IABP and ECMO**      Total Hours 50

**UNIT I**

**Effect of CPB**, Effect of CPB on CNS, Effect of CPB on Respiratory System, Effect of CPB on Renal system, Effect of CPB on Hepatic system

**UNIT II**

Effect of CPB on Immune system, Effect of CPB on Endocrine system, Systemic Inflammatory Response Syndrome, Heparin Resistance, Heparin Induced Thrombocytopenia, Protamine Reactions

**UNIT III**

Introduction to IABP, Parts of IABP machine, Parts of IABP balloon, Insertion sites, Different IABP sizes, Indications, steps of insertion and removal, complications and contraindications

**UNIT IV**

Introduction to ECMO, Components of ECMO circuits, Indications and contraindications to ECMO, Types of ECMO

**UNIT V**

Safety devices in CPB, Level detector, Bubble detector Pressure sensor, Pump slave, Hand cranks, Pulsatile, Perfusion.

**Practical** Level detector, Bubble detector, Pressure sensor, Pump slave, Hand cranks, Pulsatile Perfusion, Introduction to IABP, Indications, steps of insertion and removal, complications and contraindications:

Identification, Uses, Principles, Discussion and Demonstration of above practical syllabus- Connecting and setting up the IABP

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**B.Sc. Perfusion Technology**  
**Semester VI**  
**Paper 2-**  
**Special Situations in Perfusion Technology**      Total Hours 50

**UNIT I**

CPB CHECK LIST, Prebypass check list, Initiation of CPB, Maintenance of CPB, Weaning of CPB

**UNIT II**

CPB special conditions, Foetal circulation, CPB in pregnancy, Reperfusion injury

**UNIT III**

CPB in Infants & Children, Selection of circuit, Selection of cannulae Blood prime

**UNIT IV**

Management of CPB in Cyanotic patients, Blood Gas Management, ABG, VBG calculation of circulating haematocrit, Various priming options

**UNIT V**

Hemo-concentration, Conventional ultrafiltration CUF, Modified Ultra filtration MUF

Practical:

- Assembling of CPB circuit
- Initiation of CPB
- Maintenance of CPB
- Weaning of CPB Conventional ultrafiltration CUF
- Modified Ultra filtration MUF
- Identification, Uses, Principles, Discussion and Demonstration of above practical
- syllabus

**B.Sc. Perfusion Technology**  
**Semester VI**  
**Paper 3-**  
**Cardiac Support Devices, DHCA and Blood**  
**Conservation Techniques** Total Hours 50

**UNIT I**

Intra Aortic Balloon Pump (IABP) in detail, Indications, and contraindications, Setting up of IABP, Steps of insertion, Steps of removal, Identification and Management of complications

**UNIT II**

Cardiac Support Devices, Extra Corporeal Life Support (ECMO / ECLS), Ventricular Assist Devices (LVAD / RVAD), Artificial Heart

**UNIT III**

Blood conservation techniques in Cardiac Surgery, Preoperative, Peri Operative, Post Operative, Cell Saver

**UNIT IV**

Deep Hypothermic Circulatory Arrest (DHCA), **Steps Taken Before Going On DHCA**, Antegrade & Retrograde Cerebral Perfusion, Alpha stat management  
Ph stat management, Non hypothermic cardiac surgeries

**UNIT V**

Minimal Invasive Cardiac Surgeries, CPB for Minimal Invasive Cardiac Surgeries, CPB for Non Cardiac Surgeries, Recent advances in Perfusion

**Practical Syllabus**

- Intra Aortic Balloon Pump (IABP) in detail
- Deep Hypothermic Circulatory Arrest (DHCA)
- Antegrade & Retrograde Cerebral Perfusion
- Setting up of DHCA circuit for ACP and RCP-
- Identification, Uses, Principles, Discussion and Demonstration of above practical syllabus-

**Recommended Books**

- 1 Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)
- 2 Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
- 3 Cardiopulmonary Bypass Cambridge University- Sunit Ghosh , Florian Falter, Davis J.Cook (Editors)
- 4 Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP,FPP (editor)

# **B.Sc. Perfusion Technology**

## **Semester VI**

### **Paper 4-**

#### **Hospital Management**

Total Hours 50

**Quality Concepts:** Definition of Quality, Dimensions of Quality, Basic concepts of Total Quality Management, Quality Awards. Accreditations for hospitals: Understanding the process of getting started on the road to accreditation, National and International Accreditation bodies, overview of standards- ISO (9000 & 14000 environmental standards), NABH, NABL, JCI, JACHO.

**Hospital Information System:** Hospital Information System Management and software applications in registration, billing, investigations, reporting, ward management and bed distribution, medical records management, materials management and inventory control, pharmacy management, dietary services, management, information processing. Security and ethical challenges.

**Inventory Control:** Concept, various costs of inventory, Inventory techniques- ABC, SDE/VED Analysis, EOQ models. Storage: Importance and functions of storage. Location and layout of stores. Management of receipts and issue of materials from stores, Warehousing costs, Stock verification.

**Equipment Operations management:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS, outsourcing of maintenance services, quality and reliability, concept of failure, equipment history and documents, replacement policy, calibration tests, spare parts stocking techniques and policies

**Biomedical Waste Management:** Meaning, Categories of Biomedical Wastes, Colour code practices, Segregation, Treatment of biomedical waste-Incineration and its importance. Standards for waste autoclaving, microwaving. Packaging, Transportation & Disposal of biomedical wastes.