

BHARATHIAR UNIVERSITY, COIMBATORE – 641046.

Centre for Collaboration of Industry and Institutions (CCII) BACHELOR OF SCIENCE (PERFUSION TECHNOLOGY) REGULATIONS AND SYLLABUS

1. Objective of the course :

This course will provide the clinical knowledge and skills necessary to meet the challenges, that will be placed on a perfusionist during cardiothoracic surgeries and other advanced surgeries which are updated in an ever-changing field and enable them to be an expert member of cardiothoracic surgical team in providing life saving support for patient requiring extracorporeal circulation.

2. Eligibility for the course:

- a) Candidate seeking admission for this course shall be required to have successfully completed with 10 + 2 (HSC) by Tamilnadu State Board (or) any other examination boards / Councils /Intermediate examination established by the State Government / Central Government and recognized as equivalent with Physics ,Chemistry and Biology (PCB) subjects.
- b) Candidates with Science Degrees as recognized by Bharathiar University are also eligible.
- c) Physical fitness certificate to be obtained from a Registered Medical Practitioner.

3. Duration of the course

The duration of the course will be for 3 years .

4. Course of Study and Scheme of Examination

Course of study for B.Sc. Perfusion Technology consists of the following:

- a. The course shall be extended for a duration of three years ,comprising of two semesters in a year.
- b. Examination will be conducted at the end of every semester for the respective subjects.
- c. The course shall consist of modern or classical Language i.e. Tamil , Kannada , Malayalam , Telugu , Hindi , Sanskrit , French , Arabic , Urdu etc.
- d. English shall be offered as a communication skill and as medium of instruction.
- e. Core Subjects related to subject of study.
- f. Allied subjects are offered from first Semester to fourth semester.
- g. Elective courses are offered with one in fifth semester and two in sixth semester.
- h. Compulsory clinical internship for one month at the end of 4th semester.

BHARATHIAR UNIVERSITY: COIMBATORE 641 046

B.Sc. PERFUSION TECHNOLOGY

(For the students admitted from the academic year 2016–17 onwards)

SCHEME OF EXAMINATION – CBCS PATTERN

PART	Course Title B.Sc. PERFUSION TECHNOLOGY Subject	Instru.hrs/ week	EXAMINATION				CREDITS
			Duration	CIA	Unit Exam	Total	
SEMESTER – I							
I	Language – I	5	3	25	75	100	4
II	English – I	5	3	25	75	100	4
III	Core – I Anatomy – 1	6	3	25	75	100	4
III	Core – II Physiology – 1	6	3	25	75	100	4
III	Allied paper– I Biochemistry	6	3	25	75	100	4
IV	Environmental Studies #	2	3		50	50	2
SEMESTER – II							
I	Language – II	5	3	25	75	100	4
II	English – II	5	3	25	75	100	4
III	Core – III Anatomy – 2	6	3	25	75	100	4
III	Core – IV Physiology – 2	6	3	25	75	100	4
III	Allied Paper -II General Microbiology	6	3	25	75	100	4
IV	Value Education – Human Rights #	2	3		50	50	2
SEMESTER – III							
III	Core-V Pharmacology 1	5	3	25	75	100	4
III	Core – VI Pathology 1	5	3	25	75	100	4
III	Core – VII Introduction to Perfusion Technology	5	3	25	75	100	4
III	Allied Paper – III Psychology & Sociology	5	3	25	75	100	4
III	Skilled Based Subject - Applied Biochemistry	3	3	20	55	75	3
IV	Core Practical I - Perfusion Technology I	5	6	40	60	100	4
IV	Tamil @/ Advanced Tamil #(or)Non-major Elective – 1 Yoga for Human Excellence#/ Women’s Rights# Constitution of India #	2	3		50	50	2
SEMESTER – IV							
III	Core – VIII Pharmacology – 2	5	3	25	75	100	4
III	Core- IX Pathology – 2	5	3	25	75	100	4
III	Core-X Cardio Pulmonary bypass & perfusion technology	5	3	25	75	100	4
III	Allied-IV Basics of Computer	4	3	25	75	100	4
IV	Skilled Based Subject - Principles of perfusion technology	4	3	20	55	75	3
IV	Core practical II – Perfusion Technology 2	5	6	40	60	100	4
IV	Tamil@/Advanced Tamil #(or) Non-major Elective II: General awareness#	2	3		50	50	2

SEMESTER - V							
III	Core-XI Cardio Pulmonary Bypass & Complication	5	3	25	75	100	4
III	Core – XII Medicine related to Perfusion Technology	5	3	25	75	100	4
III	Core – XIII Introduction to Surgery & Central Sterile Supplies Department	5	3	25	75	100	4
III	Elective – I	5	3	25	75	100	4
IV	Skilled Based Subject – Perfusion Technology Advanced 1	4	3	20	55	75	3
III	Core Practical 3: Perfusion technology 3	6	6	40	60	100	4
SEMESTER – VI							
III	Core-XIV Perfusion Technology Applied	4	3	25	75	100	4
III	Core - XV – Clinical Biochemistry	4	3	25	75	100	4
III	Elective – II	4	3	20	55	75	3
III	Elective – III	4	3	20	55	75	3
IV	Skilled Based Subject – Perfusion Technology Advanced 2	4	3	30	45	75	3
III	Core Practical 4: Perfusion Technology 4	6	6	40	60	100	4
V	Extension Activities @	4	3		50	50	2
TOTAL		180 hrs				3500	140

@ No University Examinations . Only Continuous Internal Assessment (CIA)

No Continuous Internal Examinations (CIA). Only University Examinations

List of Elective papers (students can choose any one of the paper as electives)		
Elective – I	A	Role of perfusion technology in cardiopulmonary bypass.
	B	Blood conservation techniques related to perfusion technology.
	C	Role of perfusion in Pediatric Surgery.
Elective – II	A	Myocardial preservation related to perfusion technology
	B	Role of perfusion in extracorporeal membrane Oxygenation.
	C	Role of perfusion in haemodialysis and haemofiltration
Elective - III	A	Role of perfusion technology in mechanical assistance
	B	Heart lung machine
	C	Perfusion emergency and incidents management

SEMESTER – 1
CORE I- ANATOMY-1

OBJECTIVE:

This subject will provide the knowledge on the structural, topographical and functional anatomy of various human systems.

UNIT – 1 : Introduction: Human body .

Definition of anatomy and its divisions – Terms of location, Positions and planes – Cell and its organelles : Epithelium – definition, Classification, describe with examples, function : Glands-Classification, describe serous & mucous glands with examples – Basic tissues – Classification with examples – Histology of types of epithelium – Histology of serous, mucous & mixed salivary gland

UNIT- 2 : Locomotion and support

Cartilage – types with example & histology – Bone- Classification, name of bone cells, parts of long bone, microscopy of compact bone, name of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull. Joints- Classification of joints with examples, synovial joint (in detail for radiology) – Muscular system: Classification of muscular tissue & histology, Name of muscles of the body.

UNIT – 3 : Cardiovascular system

Heart – Size, location, chambers, exterior & interior – Blood supply of heart – systemic & pulmonary circulation – Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery – peripheral pulse – Inferior venacava, portal vein, portosystemic anastomosis – great saphenous vein – Dural venous sinuses
Lymphatic system – cistern chyli & thoracic duct – Histology of lymphatic tissues – Names of regional lymphatics, axillary and inguinal lymph nodes in brief.
Histology of lymph node, spleen, tonsil & thymus .

UNIT– 4 : Gastro-intestinal system

Parts of GIT, oral cavity (lip, tongue, tonsil, dentition, pharynx, salivary glands, Waldeyer's ring) , Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas.

UNIT – 5 : Respiratory System

Parts of Respiratory System, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments – Histology of trachea, lungs and pleura – Names of paranasal air sinuses – Peritoneum.

Recommended & Reference books:

Recommended Text Books:

1. William Davis (P) Understanding Human Anatomy and Physiology , Saunders Publishers ,11 th edition 1987.
2. B.D Chaurasia's Human Anatomy , CBS publishers, 7th edition ,2016.
3. T.S. Ranganathan – Textbook of Human Anatomy S Chand Publishers, 2000.
4. Gray's Anatomy: The Anatomical Basis of Clinical Practice, 41e Hardcover, 2015.
5. Richard S. Snell, Clinical Anatomy ,Wolter Kluwer; 9 edition , 2012.
6. ESTER . M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
7. [Frank H. Netter MD](#), Atlas of Human Anatomy: Including Student Consult Interactive Ancillaries and Guides, Saunders; 6e (Netter Basic Science) , 2014 .

SEMESTER – 1
CORE II -PHYSIOLOGY - 1

OBJECTIVE:

This subject will provide the knowledge on the functions of various human systems, with their fundamental reactions and guidelines to measure the biochemical body functions.

UNIT – 1: Introduction – Composition and function of blood

Red blood cells – Erythropoiesis, stages of differentiation function, count physiological Variation. Haemoglobin – structure, functions, concentration physiological variation – methods of Estimation of Hb – White blood cells – production, function, life span, count, differential count, Platelets – Origin, normal counts, morphology functions – Plasma Proteins – Production, concentration, types, albumin, globulin, Fibrinogen, prothrombin functions. Haemostasis & Blood coagulation – Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors. Blood Bank – Blood groups – ABO system, Rh system – blood grouping & typing – cross matching – Rh system – Rh factor, Rh in compatibility – Blood transfusion – Indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions Anticoagulants – classification, examples and uses
Anemia: Classification – morphological and etiological effects of anemia on body – Blood indices – color index, MCH, MCV, MCHC – Erythrocyte sedimentation Rate (ESR) and Packed cell volume – Normal values, Definition, determination, Blood Volume – Normal value, determination of blood volume and regulation of blood

volume – Body fluid – PH, normal value, regulation and variation – Lymph – lymphoid tissue formation, circulation, composition and function of lymph

UNIT-2: Cardiovascular system

Heart – Physiological Anatomy, Nerve supply – Properties of Cardiac muscle. Cardiac cycle-systole, diastole. Intraventricular pressure curves - cardiac output – only definition. Heart sounds normal heart sounds areas of auscultation. Blood pressure – definition, normal value, clinical measurement of blood pressure, physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension. Pulse – jugular, radial pulses, triple response. Heart sounds – Normal heart sounds, cause characteristics and signification. Heart rate Electrocardiogram (ECG) - significance

UNIT-3 : Digestive System:

Physiological anatomy of Gastro intestinal tract, Functions of digestive system salivary glands – structure and functions. Deglutination – stages and regulation Stomach-structure and functions-gastric secretion – composition function regulation of gastric juice secretion – pancreas – structure, function, composition, regulation of pancreatic, juice-Liver-functions of liver – Bile secretion, composition, function regulation of bile secretion, bilirubin metabolism types of bilirubin, van den berg reaction, jaundice-types, significance, gall bladder – functions – intestine – small intestine and large intestine – small intestine – functions – digestive and absorption of carbohydrates, proteins, fats, lipids, defecation

UNIT-4 : Respiratory System:

Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles, respiratory organ- lungs, alveoli, respiratory membrane, stages of respiration. Mechanism of normal and rigorous respiration, forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall.

Transportation of Respiratory gases:

Transportation of Oxygen: direction, pressure gradient, forms of transportation, oxygenation of Hb. Quantity of oxygen transported

UNIT-5 : Lungs volumes and capacities

Regulation of respiration .Mechanisms of regulation, nervous and chemical regulation, respiratory centre, hearing barrier, reflexes.

Applied physiology and Respiration: Hypoxia, Cyanosis, Asphyxia, Dyspnoea, Dysbarism, Artificial respiration, Apnoea, Endocrine system – definition classification of endocrine glands & their hormones properties of hormones.

Recommended & Reference books:

Physiology

Recommended Text Books:

1. [Sujit K Chaudhuri](#) Concise Medical Physiology ; New Central Book Agency (P) Ltd; 1 edition (2016).
2. Chatterjee S, Human Physiology , Volume1 & 2; CBS Publishing; 11 edition; 2016.
3. [A.P. Krishna](#); Textbook Of Medical Physiology 2nd Revised Edition Medtec 2014.
4. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton & Lange; 20th edition 2001.
5. [John E. Hall](#) , [Mario Vaz](#) ;Guyton & Hall Textbook of Medical Physiology ; Elsevier Health; 2ed ,2016.

SEMESTER – 1 ALLIED PAPER I-BIOCHEMISTRY

OBJECTIVE:

This subject will provide the knowledge on the organisms causing diseases including infections and precautionary measures to protect from infection.

Unit I:

Carbohydrates: Monosaccharides-classification, stereochemistry; cyclic structure and anomeric forms; Haworth projection, reactions of monosaccharides – characteristics of aldehyde and ketone groups. Action of acids and alkalis on sugars. Reactions of sugars due to hydroxyl groups. Trisaccharides - structure and functions of raffinose. Polysaccharides: storage polysaccharides-starch, glycogen, dextrin and insulin. Structural polysaccharides: cellulose, chitin, glycosaminoglycans (structures not required). Artificial sweeteners – saccharin aspartame, monellin, neohesperidine dihydrochalcone.

Unit 2:

Lipids: definitions; classification of lipids – simple, compound and derived lipids, simple lipids; physical and chemical properties of fats.

Compound lipids – structure and function of phospholipids, glycolipids and lipoproteins. Derived lipids: fatty acid-saturated and unsaturated.

Fatty acids: essential fatty acids; steroids- structure of cholesterol, ergosterol and stigma sterol. Value of lipids in cardiovascular diseases (atherosclerosis).

Unit 3:

Amino acid and proteins Amino acids: definitions. Amino acids as ampholytes. Structure and classification of amino acids. Chemical reactions of amino acids to carbonyl groups and amino groups.

Peptides: structure and properties. Identification of N and C terminal residues. Determination of primary structure of peptides.

Proteins: classification; properties, structure of proteins: strong and weak bonds; primary structure- insulin, secondary structure-collagen and keratin

Determination of primary structure of peptides – glutathione, oxytocin and vasopressin

Unit 4:

Nucleic acids: structure of purines and pyrimidines; nucleotides and nucleosides, DNA. Double helix; A, B & Z forms; DNA denaturation and renaturation. RNA: types, unusual bases. Enzymatic hydrolysis of nucleic acids. DNA as genetic material. Structure of chromatids, nucleosome and histones.

Unit 5:

Vitamins and Minerals:

Vitamins: definition, classification, fat soluble vitamins – sources, structure and physiological functions; water soluble vitamins – sources, structure and physiological functions.

REFERENCES:

1. Ambika shanmugam, Fundamentals of biochemistry for medical students
2. Deb, AC, Fundamentals of Biochemistry, New central agency, Calcutta, 3rd edition, 1989
3. Lehninger.A.L., Nelson.D.L., Cox.M.M, Principles of biochemistry, CBS publishers, 2nd edition, 1993.
4. Lubert stiver, Biochemistry, freeman and company, 4th edition, 1995
5. Harpers text book of biochemistry-Revised edition, 2004.

SEMESTER – 2 CORE III- ANATOMY-2

OBJECTIVE:

This subject will provide the students with the knowledge on the structural, topographical and functional anatomy of various human systems of excretory, reproductive, glands and special senses.

Unit 1: Urinary system:

Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.

Unit 2: Reproductive system:

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology) parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology) – Mammary gland- gross.

Unit 3: Endocrine glands:

Name of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, supra renal gland-(gross & histology).

Unit 4: Nervous system:

Neuron – classification of NS – cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology) – meninges, ventricles & cerebrospinal fluid – names of basal nuclei blood supply of brain – cranial nerves – sympathetic trunk & names of parasympathetic ganglia – histology of peripheral nerve & optic nerve.

Unit 5: sensory organs:

Skin: Skin- histology – appendages of skin. Eye: Eye parts & lacrimal apparatus – extra-ocular muscles & nerves supply. Ear: parts of ear – external, middle and inner ear and contents – histology of thin and thick skin.

Embryology:

Spermatogenesis & oogenesis – ovulation, fertilization-fetal circulation – placenta

Recommended & Reference books:

Recommended Text Books:

1. William Davis (P) Understanding Human Anatomy and Physiology , Saunders Publishers ,11 th edition 1987.
2. B.D Chaurasia's Human Anatomy , CBS publishers, 7th edition ,2016.
3. T.S. Ranganathan – Textbook of Human Anatomy S Chand Publishers, 2000.
4. Gray's Anatomy: The Anatomical Basis of Clinical Practice, 41e Hardcover, 2015.
5. Richard S. Snell, Clinical Anatomy ,Wolter Kluwer; 9 edition , 2012.
6. ESTER . M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
7. [Frank H. Netter MD](#), Atlas of Human Anatomy: Including Student Consult Interactive Ancillaries and Guides, Saunders; 6e (Netter Basic Science) , 2014 .

SEMESTER – 2
CORE IV - PHYSIOLOGY - 2

OBJECTIVE:

This subject will provide the knowledge on the functions of various human system with their fundamental reactions and guidelines to measure the biochemical body functions.

Unit 1: Hormones:

Thyroid gland hormone – physiological, anatomy, hormone secreted , physiological function, regulation of secretion. Disorders – hypo and hyper secretion of hormone – adrenal gland, adrenal cortex physiologic anatomy of adrenal gland, adrenal cortex, cortical hormones – functions and regulation – adrenal medulla – hormones, regulation and secretion. Functions of adrenaline and nor adrenaline – pituitary hormones – anterior and posterior pituitary hormones, secretion, function – pancreas – hormones of pancreas – insulin – secretion, regulation, function and action – diabetes mellitus – regulation, function and action – diabetes mellitus – regulation of blood glucose level – parathyroid gland – function, action, regulation of secretion of parathyroid hormone. Calcitonin – function and action – special senses – vision – structure of eye – function of different parts – structure of retina – hearing structure and function of can mechanism of hearing – taste- taste buds functions. Smell physiology, receptors – nervous system

Unit 2: Nervous system:

Function – neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factor affecting. Synapse – structure, types, properties. Receptors- definition, classification, properties. Reflex action – unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, descending tracts – pyramidal tracts – extrapyramidal tracts. Functions of medulla, pons, hypothalamic disorders. Cerebral cortex lobes and functions, sensory cortex, motor cortex, cerebellum functions of cerebellum. Basal ganglion – functions. EEG-cerebro spinal fluid (CSF): formation, circulation, properties, composition and functions of lumbar puncture. Autonomic nervous system: sympathetic and parasympathetic distribution and functions and comparison of functions.

Unit 3: Excretory System:

Kidneys- functions of kidneys – structural and functional unit nephron, vasa recta, cortical and juxtamedullary nephrons – comparison, juxta glomerular apparatus – structure and function. Renal circulation peculiarities. Mechanism of urine formation: ultrafiltration of criteria for filtration GFR, plasma fraction, EFP, factors effecting EFR, determination of GFR selective reabsorption – sites of reabsorption substance reabsorbed, mechanisms of reabsorption glucose, urea.

H+Cl aminoacids etc., TMG, tubular load, renal threshold % of reabsorption of different substances, selective secretion.

Properties and composition of normal urine, urine output. Abnormal constituents in urine, mechanism of urine concentration.

Counter– current mechanisms: micturition, innervation of bladder, cystourethrogram – diuretics: water, diuretics, osmotic diuretics, artificial kidney renal function tests- plasma clearance actions of ADH, aldosterone and PTH on kidneys, renal function tests

Unit 4: Reproductive system:

Functions – puberty, male reproductive system. Function of testis, spermatogenesis site, stages, factors influencing semen. Endocrine functions of testis, androgens – testosterone structure and functions. Female reproductive system, ovulation, menstrual cycle. Physiological changes during pregnancy, pregnancy test, Lactation: composition of milk factors controlling lactation

Muscle nerve physiology- classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, neuromuscular junction. Transmission across, neuromuscular junction. Excitation contraction coupling. Mechanism of muscle tone, fatigue rigour mortis

Unit 5: Skin-structure and function:

Body temperature measurement, physiological variation, regulation of body temperature by physical chemical and nervous mechanisms. Role of hypothalamus, hypothermia and fever.

Recommended & Reference books:

Physiology

Recommended Text Books:

1. [Sujit K Chaudhuri](#) Concise Medical Physiology ; New Central Book Agency (P) Ltd; 1 edition (2016).
2. Chatterjee S, Human Physiology , Volume1 & 2; CBS Publishing; 11 edition; 2016.
3. [A.P. Krishna](#); Textbook Of Medical Physiology 2nd Revised Edition Medtec 2014.
4. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton & Lange; 20th edition 2001.
5. [John E. Hall](#) , [Mario Vaz](#) ;Guyton & Hall Textbook of Medical Physiology ; Elsevier Health; 2ed ,2016.

SEMESTER – 2

ALLIED PAPER II - GENERAL MICROBIOLOGY

OBJECTIVE:

The course presents the Morphological characteristics of Micro organisms, their cultivation methods, identification. Life cycle, economic importance and microbial diseases.

UNIT– 1:

Historical Introduction,-with special reference to the contribution of Louis Pasteur, Joseph Lister, Robert Koch, Edward Jenner and Alexander Fleming; Importance of microbiology in laboratory medicine

UNIT – 2:

Classification of micro organisms; microscopy – light microscope, Dark-ground microscope, Fluorescent microscope, phase contrast microscope, and Electron microscope; observation of micro organism – wet preparations, staining preparations; anatomy of bacterial cell; morphological classification of bacteria with example

UNIT – 3:

Morphology of viruses, classification and cultivation of viruses; plaque assay. Phages:- T4 Phages stages – lifecycle; synthesis and assembly of protein Lambda phages – Life cycle; switch between lysogenic and lytic cycle/ RNA viruses:- Retroviruses and life cycle – HIV. DNA viruses:- Oncogenic viruses. Mechanism of oncogenesis

UNIT – 4:

Microbial Diseases:- Normal human micro flora; host – parasitic interaction:epidemics exo, endotoxins. Air borne diseases:- Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, polio – myelitis and Influenza, Food and waterborne diseases:- Aetiology, symptoms and pathogenesis of typhoid, cholera, Bacillary dysentery and Hepatitis. Direct contact disease :- Aetiology and symptoms of Rabies.

UNIT – 5:

Water Microbiology:- Microbes in water, Bacteriological examination of water; sewage and its treatment; purification of drinking water. Soil microbiology:- symbiotic and Non-symbiotic Nitrogen fixing organisms: Rhizospore Food microbiology; Microbiology of food borne diseases – Botulism, Salmonella, Staphylococcal poisoning – perfringens poisoning and Mycotoxins.

Recommended Text Books and Reference Books:

Recommended Text Books:

1. [R. Ananthanarayan](#) , [Arti Kapil](#); Textbook of Microbiology Orient BlackSwan; Ninth edition 2013.
2. Roberty Cruickshank – Medical Microbiology – The Practice of Medical Microbiology .

Reference Books:

1. [World Health Organization](#) ; Basic Laboratory Methods in Medical Parasitology; J P Bros 1991.
2. [World Health Organization](#) ; Basic laboratory procedures in clinical bacteriology, AITBS Pub. And Dist., Delhi (2004).
3. [John Willard Rippon PhD](#); Medical Mycology: The Pathogenic Fungi and the Pathogenic Actinomycetes ; Saunders; 3 edition, 1988.
4. [C.W. Emmons](#) ; Medical Mycology ; Lippincott Williams and Wilkins; 3rd Revised edition edition ,1977.

SEMESTER – 3

CORE V - PHARMACOLOGY-I

OBJECTIVE:

This subject will provide the knowledge on pharmaco-dynamics, pharmacokinetics, and principles of therapeutics and care of patients during administration of medications.

UNIT – 1

Autonomic nerves system:

Anatomy & functional organization – list of drugs acting an ANS including dose, route of administration, indications, contra indications and adverse effects

Cardiovascular drugs- Enumerate the mode of action, side effects and therapeutic uses of the following drugs: Antihypertensives: Beta Adrenergic antagonists – Alpha adrenergic antagonists, peripheral vasodilators- calcium channel blockers. Antiarrhythmic drugs-cardiac glycosides – sympathetic and nonsympathetic inotropic agents – coronary vasodilators – antianginal and anti failure agents-Lipid lowering & anti atherosclerotic drugs – Drugs used in Haemostasis – anticoagulants Thrombolytics and antithrombolytics – cardioplegic drugs – History, Principles and types of cardioplasia – primary solutions – history, principles & types – drugs used in the treatment of shock

UNIT-2

Anaesthetic agents: Definition of general and local anaesthetics – classification of general anaesthetics – pharmacokinetics and pharmacodynamics of inhaled anaesthetic agents – Intravenous general anaesthetic agents – Local anaesthetics – classification mechanism of action, duration of action and methods to prolong the duration of action. Preparation, dose and routes of administration.

UNIT – 3

Analgesics: Definition and classification – Routes of administration, dose, frequency of administration, side effects and management of non opioid and opioid analgesics - Antihistamines and antiemetics – Classification, mechanism of action, adverse effects, preparations, dose and routes and administration

CNS stimulants and depressants: Alcohol – sedatives, hypnotics and narcotics – CNS stimulants – Neuromuscular blocking agents and muscle relaxants. Pharmacological protection of organs during CPB

UNIT – 4

Inhalational gases and emergency drugs – pharmacotherapy of respiratory disorders: Introduction-Modulators of bronchial smooth muscle tone and pulmonary vascular smooth muscle tone – Pharmacotherapy of bronchial asthma – pharmacotherapy of cough – Mucokinetic and mucolytic agents – use of bland aerosols in respiratory care. Corticosteroids – Classification, mechanism of action, adverse effects and complications. Preparation, dose and routes of administration. Diuretics: Renal physiology, Side of action of diuretics – Adverse effects – preparation, dose and routes of administration.

UNIT – 5

Chemotherapy of infections: Definition- classification and mechanism of action of antimicrobial agents – combination of antimicrobial agents – chemoprophylaxis – classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, antitubercular drugs.

Miscellaneous: IV fluids- various preparations and their usage – Electrolyte supplements – Immunosuppressive agents – New drugs included in perfusion technology – drugs used in metabolic and electrolyte imbalance

References:

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, Elsevier India; 24 edition , 2015.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Jaypee Brothers Medical Publishers; seventh edition (2013).

SEMESTER – 3
CORE VI - PATHOLOGY-I

OBJECTIVE:

This subject will provide the knowledge on deviations from normal to abnormal structure and functions of the body system in various disease conditions.

UNIT – 1

Introduction – Blood collection-Anticoagulants used in Haematology normal values in Haematology-Basic Hematological techniques: RBC Count, Haemoglobin estimation, packed cell volume, WBC counts (total and differential), absolute eosinophil count, platelet count, erythrocyte sedimentation rate, reticulocyte count-preparation of blood films-stains used in Haematology-Morphology of red cells-Morphology of Leukocytes and platelets-Bone marrow: techniques of aspiration, preparation and staining of films, Bone marrow biopsy, preparation of buffy coat smears

UNIT-2: RESPIRATORY SYSTEM:

Laboratory methods used in the investigation of anaemia: B12 and folate assay-schilling test-serum iron and iron bonding capacity. Laboratory methods used in the investigation of haemolytic anaemias: osmotic fragility-investigation of G-6 PD deficiency-Test for sickling-Estimation on of Hb-F, Hb-A2-Plasma haemoglobin and Haptoglobin.

UNIT – 3: CARDIOVASCULAR SYSTEM:

Investigation of Haemorrhagic disorders: Mechanism of coagulation-collection and anti coagulants used in coagulation studies- bleeding time and clotting time-other coagulation studies PT, KPTT,TGT, etc.,- assay of clotting factors

UNIT – 4: GASTRO INTESTINAL TRACT

Test for blood fibrinolytic activity and detection of FDP Platelet function tests .

UNIT – 5: KIDNEYS & URINARY TRACT :

Automation in haematology – organization and quality control in haematology laboratory – preparation of glassware and disposal of the waste in the laboratory

REFERENCE TEXT BOOKS:

1. Todd and Sanford, clinical diagnosis by laboratory method
2. Culling-Histopathology techniques
3. Dycie and Lewis-Practical haematology
4. Ramani Sood. Laboratory technology Methods and interpretations 4th Ed. J.P. Bros, New Delhi, 1996
5. Satish Gupta-Short text book of medical laboratory for technicians, J.P. Bros, New Delhi

SEMESTER – 3

CORE VII – INTRODUCTION TO PERFUSION TECHNOLOGY I

OBJECTIVE:

This subject will provide the knowledge on introduction, Scope of perfusion technology and basic instrumentation.

UNIT – 1:

Physiology of extra corporeal circulations – Heart Lung Machine Basics – Principles of extracorporeal circulation – History of evolution of pump – principles of extracorporeal gas exchange

UNIT – 2:

Various types of Oxygenators – Bubble, Membrane – Theory of blood pump – Pulsatile flow, continuous flow- occlusive and non-occlusive pumps

UNIT – 3

Various types of pumps – Rotatory pumps, Roller pumps, Bellow pumps, compression pump, Diaphragm pump, Ventricle pump

UNIT – 4

IABP: Elements of extracorporeal circulation and its hazards – Blood filters – Bubble trap – flow meter – Temperature probes – Heat exchangers – regulating devices

UNIT – 5 :

Connections of vascular system and extracorporeal circulation: Venous drainage – suction pump – Hemodynamics of Arterial reentry – Arterial infusion – cardiotomy blood return

Recommended Books:

1. Bryan Lich, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
2. D.Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. Linda B Mongero, Advanced perfusion techniques , Humana Press, 2008.
4. R.A Guyton, Principles and techniques of extracorporeal circulation, Springer Newyork , 2011.
5. Braunwold , Textbook of Cardiology , Elsevier Health , 10th edition , 2014.
6. J Kaplan , Text book of Cardiac Anaesthesia, Elsevier Health , 6th edition , 2011.

7. L.H. Otrie , Drugs for the Heart , Saunders, 8th edition , 2009.

SEMESTER – 3

ALLIED III - PSYCHOLOGY & SOCIOLOGY

PSYCHOLOGY

OBJECTIVE:

This subject will provide the knowledge of fundamentals of Psychology and develop an insight into behavior of self and others and sociology related to community and social institutions in India and its relationship with health and illness

UNIT 1

Introduction: Definition of psychology, scope and methods of psychology- Attention: Types, determinants, duration and degree, alterations -Perception: Meaning, Principles, factors affecting, errors-Learning: Nature, Types, learner and learning, Factors influencing, laws and theories, process, transfer, study habits.-Memory: Meaning, types, nature , factors influencing, development theories and methods of memorizing and forgetting -Thinking: Types and levels, stages of development, relationship with language and communication

UNIT 2

Motivation: Definition and nature of motivation - Biological and social motive -Frustration and conflicts - Self-actualization - Emotions and stress - Emotions: Definition, components, changes in emotions, theories, emotional adjustments, emotions in health and illness - Stress: stressors, cycle, effect, adaptation and coping - Attitude: Meaning, nature, development, factors affecting, behaviour and attitudes Attitudinal change -Personality: Definition, Constituents of personality.

SOCIOLOGY

UNIT 3

Definition and scope of sociology - Its relation to Anthropology, Psychology, Social Psychology.- Methods of Sociological investigations - Social Factors in Health and Disease:- Meaning of social factors -Role of social factors in health and disease -Socialization : Meaning and nature of socialization Primary, Secondary and Anticipatory socialization Agencies of socialization

UNIT 4

Social Groups: Concepts of social groups, influence of formal and informal groups on health and sickness- Family: meaning and definitions Functions of types of family Changing family patterns Influence of family on individual's health, family and nutrition.- Community: Rural community: Meaning and features – Health hazards to rural communities, health

hazards to tribal community - Urban community – Meaning and features – Health hazards of urbanities Culture and Health

UNIT 5

Social Problems – Social disorganization - Control & planning: poverty, housing, illiteracy, food supplies, prostitution, rights of women & children, vulnerable groups: Elderly, handicapped, minority groups and other marginalized groups, child labour, child abuse, delinquency and crime, substance abuse, HIV/Aids- Social welfare programmes in India

Recommended Text Books:

1. Jacob Anthikad, Textbook of Psychology, ,Jaypee Brothers,5th edition, 2014
2. K.P.Neeraja, Textbook of sociology for students, Jaypee brothers, 1st Edition, 2005.
3. Vikas Ranjan, Applied Sociology, Golden peacock publishers, 5th edition,2011.
4. Naima Katoon, General Psychology ,pearson education, India, 2012.
5. Praghya Rashmi ,Fundamentals of Psychology , Paras med publishers, 1st edition, 2015.

SEMESTER – 3

Skill Based Subject 1 - APPLIED BIOCHEMISTRY

OBJECTIVE:

This subject will provide the knowledge on practical methods and techniques used in biological investigations.

UNIT – 1

Blood & disorders -Composition & Functions of Blood , Composition of plasma in health and diseases, Plasma proteins - normal values, TC, DC, ESR, HB, PCV, bleeding time, clotting time, prothrombin time, fibrinolysis –Blood groups - Biochemical derangement in anemia - Conditions associated with abnormal acid base status -abnormal electrolytes composition of the blood -Diagnosis of acid base disorders.

UNIT – 2

Acute phase proteins - Diagnosis & clinical significance of C-reactive proteins, Alpha fetoproteins, Alpha 1 antitrypsin, Alpha 2 Macroglobulin, Haptoglobin, Ceruloplasmin. - Biochemistry of AIDS HIV- genes & gene products, Biochemical changes during HIV infection, diagnosis & precautions - Biochemistry of ageing.

UNIT-3

Normal and abnormal constituents of urine -urine preservatives, 24-hr assays, protein, calcium, phosphorus, urea, creatinine- Kidney function tests, blood urea, creatinine, uric acid, clearance tests

UNIT – 4

Diagnostic enzymology -Diagnostic importance of enzymes : LDH and isoenzymes, CPK, AST, ALT, NTP, GGT, ALP, ACP, GPD, Amylase, Lipase, , Serum GGT, 5'nucleotidase, Cholinesterase Tumour markers, Bone markers, Cardiac markers, liver markers

UNIT – 5

Liver function tests: Plasma proteins, albumin globulin ratio, functions of albumin, jaundice, types, Hb metabolism: Synthesis and degradation of hemoglobin, hemoglobinopathies, thalassemias, porphyrias, heme synthesis and degradation, bilirubin metabolism, jaundices, laboratory findings in jaundices. Serum bilirubin estimation. Porphyrins and bile pigments; Porphyrias, lead intoxication and hyperbilirubinaemia, Electrophoresis, normal and abnormal hemoglobins.

Recommended Text Books:

1. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
2. Vasudevan (DM) Sreekumari(S) Textbook of Biochemistry for Medical Students with Revision Exercises JPB; 7 edition (2013)
3. DAS (Debajyothi) Biochemistry Latest ED Academic, Publishers, Calcutta – 1992.
4. [Satyanarayana](#); Biochemistry ; Elsevier; 4 edition 2013.

Reference Books:

1. [Albert L. Lehninger](#) , [Michael M. Cox](#) ; Principles of Biochemistry W H Freeman & Co (Sd); 5 edition 2008.
2. [Denise R Ferrier](#);Biochemistry (Lippincott's Illustrated Reviews) Lippincott Williams and Wilkins; 6th edition 2013.

SEMESTER – 3

Core Practical: PERFUSION TECHNOLOGY – 1

1. Description & diagnosis of the following gross specimens
 - a. Atherosclerosis
 - b. Aortic aneurysm
 - c. Myocardial infarction
 - d. Emphysema
 - e. Chronic glomerulonephritis
 - f. Chronic pyelonephritis
2. Interpretation & diagnosis of the following charts
 - a. Hematology chart – AML, CML, Hemophilia, neutrophilia, eosinophilia

- b. Urine chart – ARF, CRF, Acute glomerulonephritis
3. Estimation of Hemoglobin
4. Estimation of Bleeding & Clotting time

SEMESTER – 4

CORE VIII - PHARMACOLOGY-2

OBJECTIVE:

This subject will provide the knowledge on pharmaco-dynamics, pharmacokinetics, and principles of therapeutics and care of patients during administration of medications.

UNIT – 1

Drugs used on skin and mucous membranes- Topical applications for skin, eye, ear, nose and buccal cavity – Antipuretics - Composition, action, dosage, route, indications, contraindications, drug interactions, adverse effects, toxicity.

UNIT-2

Drugs acting on Nervous system - CNS stimulants of depressants Analgesics and Anaesthetics – Analgesics Non steroidal anti -inflammatory (NSAID) drugs - Hypnotics and Sedatives - Cholinergic and anti-cholinergics- CNS stimulants – Neuromuscular blocking agents and muscle relaxants. Pharmacological protection of organs during CPB
Composition, action, dosage, route, indications, contraindications, drug interactions, side effects, adverse effects, toxicity.

UNIT - 3

Chemotherapy - Pharmacology of commonly used; Penicillin –Cephalosporins –Aminoglycosides - Macrolide & Broad Spectrum Antibiotics – Sulfonamides – Quinolones – Antiamoebic-Antimalarials – Anti helminthics - Antiscabies agents - Antiviral & anti-fungal agents--Antitubercular drugs-Anti leprosy drugs-Anticancer drugs-Immuno-suppressants.

UNIT – 4

Pharmacology of commonly used antiseptics, disinfectants and insecticides – Antiseptics – Disinfectants - Insecticides

UNIT – 5

Miscellaneous - Drugs used in de-addiction - Drugs used in CPR and emergency--Vitamins and minerals – Immunosuppressants – Antidotes – Antivenom -Vaccines and sera

References:

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 24 edition 2015.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, 7th edition , 2013.
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition

SEMESTER – 4

CORE IX - PATHOLOGY 2

OBJECTIVE:

This subject will provide the knowledge on deviations from normal to abnormal structure and functions of the body system in various disease conditions.

UNIT – 1

Instrumentation: Tissue processor-knife sharpener-automatic slide stainer-Microtome, knives-freezing microtome; cryostat-Instruments for grossing-electric saw

UNIT- 2

HistoPathology :Introduction to Histo Pathology.- Receiving of Specimen in the laboratory -Grossing Techniques - Mounting Techniques – various Mountants - Maintenance of records and filing of the slides. - Use & care of Microscope - Various Fixatives, Mode of action, Preparation and Indication.- Bio-Medical waste management - Section Cutting - Tissue processing for routine paraffin sections - Decalcification of Tissues. - Staining of tissues - H& E Staining

UNIT - 3

Use of microscope, polarisers- Introduction to Electron Microscopy and technique of preparing slides – maintenance of records and filing slides, familiarization with computer – microphotography - technique

UNIT – 4

Hormone Cytology:

Various cytological indices: maturation Index-karyopyknotic Index- Maturation value.

Malignant cytology:

Female genital tract, techniques of collection of specimen- Cervical Malignancy – Classification of cervical smear and characteristics of normal inflammatory, and dysphasia (mild, moderate, severe), Ca-in-situ, sq Cell carcinoma and adenocarcinoma of endocervix. Characterization and radiation changes

in cells – Endometrial Malignancy, cytology of normal hyperplasia and adenocarcinoma- Miscellaneous Ovarian carcinoma etc., Cytological screening of cervical cancer (organ screening) programme, evaluation and follow up-

Respiratory tract:

Collection, selection of material and making smear – Cytology of various types of bronchogenic carcinomas

UNIT- 5

Urinary tract:

Collection and preparation of samples – cytology of normal, non-malignant and malignant tissues of urinary tract

Gastrointestinal tract:

Classification and preparation of samples – characteristics of normal and malignant cytology

Effusion & CSF:

Collection and preparation of fluid for cytological examination

Cytological features of non-indignant and malignant effusions

Glands:

Cytological features of fine needle (FNAC) aspiration and discharge

References:

1. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, 1996.
2. [Ramnik Sood](#), Medical Laboratory Technology: Methods and Interpretation Paperback – 2009.
3. Satish Gupta Short text book of Medical Laboratory for technician 26 J.P. Bros, New Delhi – 1998

SEMESTER – 4

CORE XI – Cardio Pulmonary Bypass & Perfusion Technology

OBJECTIVE:

This subject will provide the knowledge on the organisms causing diseases including infections.

UNIT– 1

Haemodynamic aspects of total heart – Lung bypass – Perfusion flow pressure and resistance distribution of blood flow among various vascular beds

Metabolic aspects of total heart – Lung bypass oxygen need and perfusion flow requirements – perfusion flow and oxygen uptake – Acid: base balance. Electrolyte and water balance – oxygen toxicity

UNIT - 2

Effects of perfusion on organs – Brain, heart, lungs, kidney, liver and spleen area and other organs

Control of adequacy of perfusion: The ideal perfusion, Monitoring devices, Techniques of control

Hematological problems: Blood prime, priming solutions, control of effects of various priming solution on RBC trauma

UNIT - 3

Induced cardiac arrest and myocardial protection – physiological principles of including cardiac arrest, morphology, function and metabolism of the arrested heart. Cardioplegia- cold blood, potassium and Modified cold prime cardioplegia

UNIT - 4

Hypothermia: Blood stream cooling nerves peripheral cooling modes of blood stream cooling heart and circulation at low temperature

UNIT - 5

Assisted circulation: Circulatory support metabolic support by partial heart lung bypass. Effects of partial heart – lung bypass on organs

Biomedicus pump – LV Assist devices: LVAD, RVAD, BIVAD- Intra aortic balloon pump: IABP-autotransfusion, cell saver.

Recommended Books:

1. Bryan Lich, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
2. D.Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. Linda B Mongero, Advanced perfusion techniques , Humana Press, 2008.
4. R.A Guyton, Principles and techniques of extracorporeal circulation, Springer Newyork , 2011.
5. Braunwold , Textbook of Cardiology , Elsevier Health , 10th edition , 2014.
6. J Kaplan , Text book of Cardiac Anaesthesia, Elsevier Health , 6th edition , 2011.
7. L.H. Otrie , Drugs for the Heart , Saunders, 8th edition , 2009.

SEMESTER – 4 **Allied 4 – Basics of Computer**

Unit I:

Introduction: Block diagram of a computer – working of a computer – parts of a computer – classification of computer – identification of various parts of PC

Unit 2:

INPUT DEVICES: Keyboard – types of keyboard – Mouse – Touch screen; touch pads, light pen, track ball, joystick – scanning devices; types - optical bar code reader – Digitizer; electronic card reader – voice recognition devices – vision input devices – vision input devices, web camera

OUTPUT DEVICES: Monitors – Types of monitors – other types of displays – speakers- secondary storage devices printer type of printers – plotters

Unit 3:

Generation of computers – programming languages – network – advantages of networking – types of computer network – Modem – type – processors – types of processor

Unit 4:

INTRODUCTION TO OPERATING SYSTEM:

Components of OS – Functions of OS – OS services – UNIX – LINUX – Mac OS – IBM OS/2- other types

DoS-Installation of MS-DOS commands – limitations of MS-DOS- DOS structure

Unit 5:

SYSTEM FILES:

Batch file program – windows users – configuration files – booting the system – reformatting & repairing hard disk- Windows XP – features application & uses

Reference book:

1. Fundamentals of Computer Application

SEMESTER – 4

Skill Based Subject: Principles of Perfusion Technology

Unit 1:

Physiology of extra corporeal circulations – Heart Lung Machine Basics – History of evolution of Pump

Unit 2:

Principles of extracorporeal gas exchange – Various types of Oxygenators – Bubble - Membrane

Unit 3:

Theory of Blood pump – pulsatile flow – continuous flow – Occlusive and non- occlusive pumps – Various types of pumps – Rotatory pumps – Roller pumps – Bellow pumps – compression pump – Diaphragm pump – Ventricle pump - IABP

Unit 4:

Elements of extracorporeal circulation and its hazards – Blood filters – Bubble trap – Flow meter – temperature probes – Heat exchangers – Regulating devices

Unit 5:

Connections of vascular system and extracorporeal circulation – Venous drainage, Suction pump – Hemodynamic of Arterial reentry – Arterial infusion

Reference book:

1. Bryan Lich, Manual of clinical perfusion, Perfusion Publications 2nd edition, 2004.
2. D. Mark Brown, Manual of clinical Perfusion, Perfusion, Perfusion Publications 2nd edition, 2004.
3. Farhood Saremi, Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis, Wolters Kluwer Health; First Edition, 2015.

SEMESTER – 4

Core Practical: Perfusion Technology – 2

1. Pharmacokinetics and pharmacodynamics of cardiopulmonary bypass
2. Drugs (including anesthetic drugs) used in cardiopulmonary bypass
3. Conduct and monitoring of cardiopulmonary bypass
4. Adequacy of perfusion – general considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy
5. Pulsatile perfusion – Introduction, theory & Physiology of pulsatile flow, hemodynamic, metabolic effects, clinical use, hematological effects
6. Cannulation techniques during cardiopulmonary bypass
7. Termination of cardiopulmonary bypass – principles and methodology
8. Myocardial protection and cardioplegia – pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific

- clinical problems, complications of cardioplegia. Non- cardioplegic methods during cardiac surgery on cardiopulmonary bypass
9. Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function
 10. Heat Exchangers – principles functions of the heat exchangers & their assessment. Complications related to heat exchange and their management
 11. Priming fluids and hemodilution

SEMESTER – 5

CORE XI – Cardio Pulmonary Bypass & Complication

OBJECTIVE:

This subject will provide the knowledge on the organisms causing diseases including infections.

UNIT– 1

Complications while initiating the bypass, during bypass and at the termination of bypass. Hemolysis / haematuria / hemoglobinurea. Air locking, air embolism – rewarming and cooling, cerebral damage – Loss of electrical power – running a pump with hand rotation

UNIT - 2

Investigations: Routine – Haematological – their significance – urine – E.C.G. – Chest X-ray
Special- Endocrine, hormonal assays, Echocardiography, Angiography, Liver function test, renal function test, others

UNIT - 3

Sterile techniques and surgical asepsis: preparation and assembling of circuits on heart lung machine. Taking circuits from the surgeons. Assembling filters.

UNIT - 4

Knowledge of surgical asepsis, skin preparation for invasive procedures

UNIT - 5

Proper cleaning, attending troubleshoot in time and periodical maintenance including cultures taken specific intervals from heart lung machine and hemotherm.

Reference book:

1. Bryan Lich, Manual of clinical perfusion, Perfusion Publications 2nd edition, 2004.
2. D. Mark Brown, Manual of clinical Perfusion, Perfusion, Perfusion Publications 2nd edition, 2004.
3. Farhood Saremi, Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis, Wolters Kluwer Health; First Edition, 2015.

SEMESTER – 5

Core XIII– Medicine related to Perfusion Technology

Objective: To provide advanced knowledge and recent trends in medicine in perfusion technology.

UNIT – 1

Hematology- Anaemia, Bleeding disorders, Laboratory tests used to diagnose bleeding disorders .

Respiratory System: Chronic obstructive airway diseases (COPD) – Concept of obstructive versus restrictive pulmonary disease – PFT and its interpretation.

UNIT - 2

Renal System ARF & CRF - End stage renal disease - Role of dialysis and renal transplantation in its management.

CNS Automatic nervous system - (Sympathetic & Parasympathetic system) - Brief mention of CNS disorders & their etiology.

UNIT - 3

Diabetes Mellitus and its types - Obesity – Pregnancy - Pediatric (neonate/Infant) , Adult and Elderly patient

UNIT – 4

Basics of diagnostic techniques: Chest X-ray-ECG-Echo-Angiography-Nuclear Cardiology- Laboratory investigations in relation to perfusion technology.

Cardiovascular system – Ischemic heart diseases – Rheumatic heart disease- Congenital heart disease – Hypertension – Aortic Aneurysms – Cardiomyopathy – Peripheral vascular disease – Pulmonary edema and LV failure.

UNIT – 5

Monitoring and instrumentation - Concepts of monitoring – instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors,- ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring- defibrillators and fibrillators- Piped and non-piped gas delivery systems and connections- Basic physics related to medically used gases- Haemodynamic monitoring - Haemostatic monitoring - Haematologic monitoring .

References:

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, Elsevier India; 24 edition , 2015.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Jaypee Brothers Medical Publishers; seventh edition (2013).
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.
4. [Farhood Saremi](#), Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis , First edition 2015.

SEMESTER – 5

**CORE – XIV - INTRODUCTION TO SURGERY & CENTRAL STERILE
SUPPLIES DEPARTMENT**

Objective:

This subject will provide the basic knowledge about various surgeries and the central sterile methods used in health care setup.

UNIT - 1

Introduction to Cardiothoracic surgery and perfusion: Specific reference of Gibbon Lillehei, Carrel , Pre CPB surgery , Azygous Flow principle, Hypothermic/non hypothermic non-CPB surgery including Gross's, Well technique and controlled cross circulation.

UNIT - 2

Basics of diagnostic techniques: Chest of X-ray, ECG , Echo , Angiography , Nuclear Cardiology, Laboratory investigations in relation to perfusion technology , Cardiopulmonary bypass and perfusion technology .

UNIT - 3

Cannulation techniques during cardio pulmonary bypass , Termination of cardiopulmonary bypass – principles and methods , Myocardial protection and cardioplegia: pre treatment of the Myocardium - Hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications

of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass.

UNIT – 4.

Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases, zones for a smooth work flow: The unclean and washing area , The assembly and packing area , Sterile techniques and its types in the work flow process of CSSD.

UNIT-5

Element of extracorporeal circulation/hazards of: Blood failure , Bubble trap , Flow meters , Temperatures , Heat exchanger , Regulating devices. ECMO- special perfusion techniques for special cardiac surgeries and medical conditions Perfusion for non cardiac surgery, invasive cardiology and outside the operation suite.

Recommended Books:

1. Bryan Lich, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
2. D.Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. Linda B Mongero, Advanced perfusion techniques , Humana Press, 2008.
4. R.A Guyton, Principles and techniques of extracorporeal circulation, Springer Newyork , 2011.
5. Braunwold , Textbook of Cardiology , Elsevier Health , 10th edition , 2014.
6. J Kaplan , Text book of Cardiac Anaesthesia, Elsevier Health , 6th edition , 2011.
7. L.H. Otrie , Drugs for the Heart , Saunders, 8th edition , 2009.

SEMESTER – 5

Skill Based Subject 3: Perfusion Technology Advanced I

Unit 1: Medical Ethics & The Relevant Medico Legal Aspects:

Responsibilities and duties, Ethical behavior & conduct, Medico legal aspects & its relation to consumer protection act.

Unit 2: Monitoring:

Concepts of monitoring – instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring defibrillators and fibrillators. Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases

Unit 3: Electricity & Electro Medical Equipments & Safe Guards:

Basic of electricity & functioning of electro medical equipments. Earthing & Care of apparatus. Static electricity – Fire and explosion: causes, prevention of fire and explosion, electrical hazards.

Unit 4: Instruments:

Haemodynamic monitoring: I Haemostatic monitoring; Maintenance of Oxygen, carbon dioxide and acid-base status and their monitoring; Neurological monitoring (SSPE, EEG and cerebral function monitoring); Aseptic technique.

Unit 5: Filtration:

Micro pore filtration during cardiopulmonary bypass, counter pulsation techniques and assist devices, Heat exchangers: Complications related to heat exchange and their management. Micro emboli – gaseous and particulate, filters used in cardiopulmonary bypass circuit

Reference book:

1. Bryan Lich, Manual of clinical perfusion, Perfusion Publications 2nd edition, 2004.
2. D. Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. Farhood Saremi, Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis, Wolters Kluwer Health; First Edition, 2015.

SEMESTER – 5

Core Practical 3: Perfusion Technology – 3

1. Blood cell trauma – analysis of forces of fluid motion, effects of physical forces of blood cell, clinical effect. Complications of blood transfusion
2. Anticoagulation on bypass, its monitoring, its reversal and complications. Heparin less bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management
3. Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimize the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass
4. Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra filtration reverse autologous priming and other methods
5. Micro emboli – gaseous and particulate, filters used in cardiopulmonary bypass circuit
6. Micro pore filtration during cardiopulmonary bypass
7. Counter pulsation techniques and assist devices

SEMESTER – 6

Core XIV - PERFUSION TECHNOLOGY APPLIED

Objective: To provide applied knowledge in extracorporeal circulation and its essential in perfusion technology.

UNIT – 1: EXTRACORPOREAL CIRCULATION:

Element of extracorporeal circulation / hazards of: Blood failure, Bubble trap, Flow meters, Temperature , Heat exchanger , Regulating devices. - Connection of the vascular system with extracorporeal circulation : Arterial and venous cannulae , connection tubes and connectors vents, suckers, cardioplegia delivery system, venous drainage. - Haemodynamics of arterial return, venous drainage, cardioplegia delivery and venting.

UNIT - 2 HEART LUNG MACHINE:

Physiology of Extracorporeal circulation - Heart Lung machine - Materials used in EC circuit - Principles of extracorporeal gas exchange.

UNIT - 3: PULSATION TECHNIQUES:

Counter pulsation techniques and assist devices - Perfusion techniques for pediatric cardiac surgery: Perfusate composition, cannulation techniques, aspects of perfusion practice in paediatric cardiac surgery, myocardial protection, removal of sutures, pressure monitoring, heparin dosage reversal. Blood grouping, handling of blood products and their management blood components and their uses.

UNIT – 4: HAEMODYNAMIC

Element of extracorporeal circulation/hazards - Arterial and venous cannulae, Haemodynamic of arterial return, venous drainage,- Blood banking, handling of blood products and their management.

UNIT- 5 : OXYGENATION

Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function) - Heat exchangers-principles function of heat

exchangers & their assessment. Complications related to-heat exchange and their management- Priming fluids and hemodilution.

Reference Book:

1. Bryan Lich, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
2. D.Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. [Farhood Saremi](#) , Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis, Wolters Kluwer Health; First edition , 2015.
4. Linda B Mongero, Advanced perfusion techniques , Humana Press, 2008.
5. R.A Guyton, Principles and techniques of extracorporeal circulation, Springer Newyork , 2011.
6. Braunwold , Textbook of Cardiology , Elsevier Health , 10th edition , 2014.
7. J Kaplan , Text book of Cardiac Anaesthesia, Elsevier Health , 6th edition , 2011.
8. L.H. Otrie , Drugs for the Heart , Saunders, 8th edition , 2009.
9. [M. Elizabeth Oates](#) (Author), [Vincent L. Sorrell](#) , Myocardial Perfusion Imaging - Beyond the Left Ventricle: Pathology, Artifacts and Pitfalls in the Chest and Abdomen Kindle Edition , Springer; 1st ed. 2017 edition 2016.

SEMESTER – 6

Core Paper XV – CLINICAL BIOCHEMISTRY

UNIT – 1 :

Disorders of carbohydrate metabolism: Normal sugar level in blood, renal threshold and regulation of blood glucose concentration. Hypoglycemia – Definition and causes. Hyperglycemia – Definition and causes. Diabetes mellitus: Introduction, aetiology, types of diabetes mellitus, clinical pathology and diagnosis. Urine testing, random blood sugar and GTT. Glycosuria, differential diagnosis of glycosuria, complication of diabetes mellitus- Diabetic ketoacidosis, Diabetic coma, Fructosuria, pentosuria, Galactosemia and Glycogen storage diseases.

UNIT - 2

Disorders of Lipid Metabolism: Plasma lipids and lipoproteins – Introduction. Hyperlipoproteinemia – Type I, II, III, IV, V and alpha – lipoproteinemia.

Hypolipoproteinemia – A-beta lipoproteinemia, Hypo – beta- lipoproteinemia, Tangiers disease and LCAP (Lecithin Cholesterol Acyl Transferase) deficiency; Artherosclerosis. Fatty liver and hyper lipidemia, Hypercholesterolemia, and Hypocholesterolemia, Lipidosis and Xanthomatosis. Tasysch’s diseases, Niemann-Pick disease.

UNIT - 3:

Disease of Aminoacid Metabolism; Plasma proteins. Abnormalities: Total plasma (Serum) proteins, Fibrinogen, Albumin, pre-albumin and Globulins. Abnormal Non-protein Nitrogen: Urea, Uric acid, Creatinine and Ammonia, Prophyria.

Aminoacid Metabolism: Cystinuria, Phenylketonuria, Maple Syrup Disease, Alkaptonuria, Albinism, and Hartnup disease.

Disorders of Purine and pyrimidine metabolism:

Disorders of purine metabolism: Normal level of uric acid in blood and urine, miscible uric acid pool. HyperUricemia and Gout; Hypouricemia – Xanthinuria and Xanthinelithiasis. Disorders of Pyrimidine metabolism: Orotic aciduria

UNIT - 4:

Gastric, Pancreatic and Intestinal Functions

Gastric Function: Introduction, Tests for gastric function- The Insulin stimulation test, determination of Gastrin in serum and Tubeless gastric analysis.

Pancreatic function: Introduction, pancreatic function tests, serum amylase and lipase; direct stimulation test, indirect stimulation test,

Intestinal function: Introduction, Test used in the diagnosis of mal absorption – determination of total faecal fat (fat balance test), test of monosaccharide absorption (xylose excretion test) and determination of total protein (Lowry’s method).

UNIT - 5

Kidney Function Test: Introduction, physical examination of urine, elimination tests, Clearance tests – Insulin clearance test, creatinine clearance and Urea clearance tests, Renal blood flow and filtration fraction.

Reference Book:

1. Burtis A. Carl and Edward R. Ashwood. Tietz text book of Clinical Chemistry, W.B. Saunders Company, 2nd edition, 1994
2. Philip D. Maync. Clinical Chemistry in Diagnosis and Treatment. ELBS publications, 6th edition, 1994
3. Varley. Text book of Clinical Biochemistry
4. Montgomery, Conway, Spector, Biochemistry – A Case oriented approach. V.C. Moshby company

SEMESTER – 6
SKILL BASED SUBJECT 4 - PERFUSION TECHNOLOGY
ADVANCED 2

Objective: To provide advanced knowledge and recent trends in perfusion technology.

UNIT – 1 : RECENT ADVANCES:

Minimally invasive surgery and the perfusionist , Recent advances in perfusion techniques , Experimental perfusion.

UNIT - 2 SAFETY PROCEDURES:

Complications and safety during cardiopulmonary bypass - bypass safety, organizational aspects, accidents, coagulopathies, mechanical and electrical failures, - perfusion management, perfusion systems, - safety for the perfusionist and surgical team management of perfusion accidents.

UNIT - 3: PROTECTION AND CARDIOPLEGIA

Myocardial protection and cardioplegia - pretreatment of the Myocardium, cardioplegia, hypothermia, controlled re-perfusion, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass

UNIT - 4: CPB CIRCUIT

Setting of a dummy CPB circuit - Managing a simulated perfusion accident on a dummy CPB circuit including changing oxygenators when on CPB, managing falling/leaking reservoir levels, venous airlocks, air in the arterial line, cardioplegia delivery failure, increased arterial line pressure, recognition of a possible dissection, run a way pump head, recognition of heat exchanger water leak into the CPB circuit, components and their uses, method of sterilization and related complications.

UNIT - 5 HEALTH CARE:

Nursing Principles. Inter-personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application

Nursing position, bed making, prone, lateral, dorsal, dorsal recumbent, Fowlers positions, comfort measures, Aids and rest and sleep

Lifting and Transporting patients: Lifting patients up in the bed. Transferring from bed to wheel chair, transferring from bed to stretcher

Bed side Management: Giving and taking bed pan, Urinal: observation of stools, urine, observation of sputum, understand use and care of catheters, enema application procedures.

Methods of giving Nourishment: Feeding, Tube feeding, drips, transfusion

Recommended Books:

1. Bryan Lich, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
2. D.Mark Brown, Manual of clinical Perfusion, Perfusion Publications 2nd edition, 2004.
3. [Farhood Saremi](#) , Perfusion Imaging in Clinical Practice: A Multimodality Approach to Tissue Perfusion Analysis, Wolters Kluwer Health; First edition , 2015.
4. Linda B Mongero, Advanced perfusion techniques , Humana Press, 2008.
5. R.A Guyton, Principles and techniques of extracorporeal circulation, Springer Newyork , 2011.
6. Braunwold , Textbook of Cardiology , Elsevier Health , 10th edition , 2014.
7. J Kaplan , Text book of Cardiac Anaesthesia, Elsevier Health , 6th edition , 2011.
8. L.H. Otrie , Drugs for the Heart , Saunders, 8th edition , 2009.
9. [M. Elizabeth Oates](#) (Author), [Vincent L. Sorrell](#) , Myocardial Perfusion Imaging - Beyond the Left Ventricle: Pathology, Artifacts and Pitfalls in the Chest and Abdomen Kindle Edition , Springer; 1st ed. 2017 edition 2016.

SEMESTER – 6

CORE PRACTICAL 4: PERFUSION TECHNOLOGY 4

1. Perfusion techniques for paediatric cardiac surgery
2. ECMO-special perfusion techniques for special cardiac surgeries and medical conditions (including thoracic aortic surgeries deep hypothermia and circulatory arrest). Perfusion for non cardiac surgery, invasive cardiology and outside the operation suite.

3. Perfusion as a method of cardiopulmonary bypass
4. Complications and safety during cardiopulmonary bypass – bypass safety, organizational aspects, accidents, coagulopathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents.
5. Minimally invasive surgery and the perfusionist
6. Recent advances in perfusion techniques
7. Experimental perfusion

ELECTIVE

Elective 1	a.	Role of perfusion technology in cardiopulmonary bypass
	b.	Blood conservation techniques in perfusion
	c.	Role of perfusion in paediatric surgery
Elective 2	a.	Myocardial preservation related to perfusion technology
	b.	Role of perfusion in extracorporeal membrane oxygenation (ECMO)
	c.	Role of perfusion in haemodialysis and haemofiltration
Elective 3	a.	Clinical application of perfusion technology in cardiac surgeries without CPB and Robotic surgery
	b.	Heart lung machine
	c.	Perfusion technology emergencies and incidents management

ELECTIVE 1

I. Role of perfusion technology in cardiopulmonary bypass

OBJECTIVE:

It is designed to provide the working knowledge of cardiopulmonary bypass techniques, conditions where it is used and complications.

UNIT – 1: Basics of cardiopulmonary conditions

Anatomy and physiology of cardiac and pulmonary circulation, cardiopulmonary conditions- coronary artery disease, atrial septal defect, ventricular septal defect, atrioventricular septal defect.

UNIT – 2: Uses of cardio pulmonary bypass

Basic procedure of coronary bypass heart surgery, surgical procedures for which cardiopulmonary bypass is used – heart transplantation, lung transplantation, aortic and cerebral aneurysms, pulmonary thrombectomy.

UNIT – 3: Components

Functional units of CPB, pumps, oxygenators, cannulae, dialysis during cardiopulmonary bypass including modified ultra filtration, veno-venous, and veno arterial.

UNIT – 4: cardiopulmonary bypass physiology

Membrane gas exchange, native gas exchange, venoarterial membrane oxygenation, cannulation techniques, decannulation, heat exchange,

Unit - 5: Complications

Adverse effects of cardiopulmonary bypass; embolism, acute respiratory distress syndrome, heart failure, post perfusion syndrome, haemolysis, capillary leak syndrome, clotting of blood in the circuit, and leakage.

References:

Cardiopulmonary bypass- Glenn P. Gravlee, Richard F. Davis, 1993

On Bypass advanced perfusion techniques, Linda B. Mongero, 2008

II. Blood conservation techniques related to perfusion technology

OBJECTIVE:

To provide the working knowledge of blood conservation techniques which is essential foundation for their clinical studies.

UNIT – 1: Blood

Physiology of blood, clotting mechanism, haemo-filtration, gas exchange and diffusion, components of blood and haemostatic.

UNIT – 2 :Minimising blood loss

Anti-coagulation on bypass, it's monitoring, reversal, complications, platelet aggregation and its dysfunction, blood products administration, fresh frozen plasma, cryoprecipitate, pharmacological agents, intra operative monitoring.

UNIT – 3 :Tolerance and altered management of anaemia

Erythropoietin and haematinics, lower haematocrit and haemoglobin levels, perfluorocarbon based oxygen carriers

UNIT – 4: Inputs

Surgical input- preoperative, intra and post operative, anaesthetic input, and haematology input, oxygen flow, oxygen toxicity

UNIT – 5: Optimizing tissue oxygenation

Physiology of gas exchange and transport of gases, respiratory membrane, diffusion of gases, oxygen dissociation curve

References:

Cardiac surgery in the adult – Lawrence H. Cohn, 2000

Blood conservation in cardiac surgery- Karl H. Krieger, Wayne Isom, 1995

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams, 2009

III Role of perfusion in pediatric surgery

OBJECTIVE:

To provide understanding about the role of perfusion in paediatric surgeries which is essential foundation for their clinical studies.

UNIT- 1: Congenital heart diseases

Anatomy of heart, cyanotic and acyanotic heart diseases, pathology of the conditions, ischemic heart diseases, atrial septal defects, ventricular septal defects, tetralogy of Fallot

UNIT- 2: Neonatal cardiopulmonary physiology

Development of lung maturity, fetal circulation, single ventricular physiology, neonatal with univentricle, parallel circulation

UNIT – 3: Management of the paediatric ECMO patient

Common paediatric diagnosis, paediatric ECMO respiratory selection guidelines, cardiac and septic shock ECMO selection guidelines.

UNIT -4 :Extracorporeal life support physiology

Native gas exchange, membrane gas exchange, pathophysiology of membrane lungs, oxygen kinetics , tissue respiration and haemodynamics.

UNIT -5: Management of anticoagulation and blood products during ECMO

Activation of the coagulation system, heparin management, clinical consequences, novel anticoagulation

References:

Perfusion for congenital heart surgery, Gregory S. Matte, 2015

Neonatal cardiology Michael Artman, Lynn Mahony, 2002

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

ELECTIVE 2

1V Myocardial preservation related to perfusion technology

OBJECTIVE:

To provide knowledge about myocardial preservation which is essential foundation for their clinical studies.

UNIT- 1: Myocardium

Anatomy of cardiac muscle, physiology of cardiac muscle, and coronary artery circulation.

UNIT- 2: Conditions

Myocardial infarction, Cardiac and respiratory failure, neonatal respiratory failure, hypoplastic left heart syndrome, left to right shunt.

UNIT- 3: Techniques

Cardioplegic, non cardioplegic techniques, and recent advances in perfusion techniques

UNIT- 4: Components

Parts of cardiopulmonary bypass, veno arterios and venovenus extracorporeal membrane oxygenation (ECMO), cannulas, oxygenation circuit,ECMO bridge, thromboelastography.

UNIT- 5: Management of cardiac patient

Blood product administration, haemofiltration and haemodialysis, coagulation management.

References

Davidsons principles & practice of medicine; Elsevier, 2014

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

Myocardial perfusion Reperfusion,coronary venous retroperfusion; S. Meerbaum, 2013

V Role of perfusion in extracorporeal membrane oxygenation

OBJECTIVE: To provide the working knowledge of extracorporeal membrane oxygenation which is essential foundation for their clinical studies

UNIT 1: INDICATIONS

Cardiac and respiratory failure, neonatal respiratory failure, cardiac bypass surgeries, kidney failure, and liver failure

UNIT 2 : Circulatory procedures

Apheresis, auto transfusion, haemodialysis, haemofiltration, and plasmaphoresis.

UNIT 3: Extracorporeal unit

Types of ECMO, blood tubing, parts of blood tubing, transducer protector, and blood pump, blood flow rate, extracorporeal pressure monitor, heparin system, Native gas exchange, membrane gas exchange, oxygen kinetics and tissue respiration, haemodynamics, ECMO cannulation and decannulation, venoarterial ECMO, oxygenation circuits.

UNIT 4: Weaning process

Resynchronization of the intra - and inter ventricular conduction by bi-ventricular pacing and bi-ventricular stimulation

UNIT 5: complications of extracorporeal circulation

Capillary leak syndrome, haemolysis, post perfusion syndrome, air embolism, clotting of the blood in the circuit, thrombosis, membrane oxygenator failure, tubing rupture, cannula problems, equipment failure

REFERENCES

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

Perfusion for congenital heart surgery, Gregory S. Matte, 2015

Techniques in Extracorporeal Circulation; Philip Kay, Christopher M Munsch, 2004

VI Role of perfusion in haemodialysis and haemofiltration

OBJECTIVE: To provide the working knowledge of haemodialysis and haemofiltration which is essential foundation for their clinical studies.

UNIT 1: Indications

Renal failure, cardiac failure, septic shock, metabolic disorders, poisoning, acute ICU management, hypertension and diabetes.

UNIT 2: Circuit set-up

Blood tubing, parts of blood tubing, transducer protector, and blood pump, blood flow rate, extracorporeal pressure monitor, heparin system.

UNIT 3: Management of anticoagulation & blood products

Activation of coagulation system, heparin management, novel anticoagulation, fistula management

UNIT 4: Procedure

Preparation of the patient- sterilisation, catheterization, monitoring conductivity level and vital signs.

UNIT 5: Complications

Cross infection, fistula failure, hypovolemic shock, cardiac failure, and respiratory complications, hypotension, hypoglycemia, cramps, cardiac arrest

References

Text book of peritoneal dialysis; R. Gokal, Ramesh Khanna, 2013

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

Oxford handbook of dialysis; Jeremy Levy, Edwina Brown, 2016

ELECTIVE 3

VII Role of perfusion technology in mechanical assistance

UNIT 1: Minimal invasive surgery

Types, indications, procedure details, laproscopy.

UNIT 2: Cardiac surgery without cardiopulmonary bypass:

Beating heart surgery, technical aspect of surgery, need of the surgery, complications of cardiopulmonary bypass.

UNIT 3: Robotic surgery:

Types of heart surgery that can be performed robotically, endovascular catheter system and its procedure.

UNIT 4: Mechanical assistive devices:

Ventilators, Thoraco ventricular assistive device, Novacor left ventricular assist device, Heart mate.

UNIT 5: Complications

Robotic surgery- Injury to organs, bleeding, infection, internal scarring, equipment failure, beating heart surgery-nausea, vomiting, minor bleeding or bruising, skin numbness, allergic skin reactions, severe heart disease, kidney disease, lung disease, infection of the breast bone, heart attack, stroke.

References:

Alvarez JM, Cooke JC, Shardey GC, **orthodox coronary artery bypass surgery, 1998**

Kolessovl, **mammary artery-coronary artery anastomosis as a method of treatment for angina, 2000**

Gulielmos V., **Beating heart bypass surgery and minimally invasive conduit harvesting, 2012**

Rolf Gilbert Kar Inderbitzi, Franca M.A. Melfi, **Minimally Invasive Thoracic and Cardiac Surgery, 2012**

Russell A. Faust, **Robotics in Surgery, 2007**

VIII Heart Lung machine

OBJECTIVE: It is designed to provide the working knowledge of cardiopulmonary bypass which is essential foundation for their clinical studies.

UNIT 1: Conduction system of heart

Physiology of conduction system, factors affecting conduction of heart, pacemakers

UNIT 2: Cardiopulmonary conditions:

Cardiac failure, Adult respiratory failure, cardiac failure, COPD, respiratory failure, pulmonary congestion, oedema and pleural effusion, Ischaemic heart disease, cardiomyopathy, peripheral vascular disease.

UNIT 3: Heart lung machine

Principles of extracorporeal circulation and gas exchange, materials used in EC circuit.

UNIT 4: various types of oxygenators

Bubble oxygenators, rotating spiral/cylinder/disc oxygenator, membrane oxygenator, mechanism of action components defoaming, rated flow.

UNIT 5 : connection of the vascular system with heart lung machine

Arterial and venous cannulae, connecting tubes and connectors, vents, suckers, cardioplegia delivery system, and venous drainage.

References

John Gibson & his heart lung machine, University of Pennsylvania press Romaine Davis, 1991

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

The Heart Lung Machine & Related Technologies of Open Heart Surgery; Phoenix Medical Communication, Medical Publishers John W. Austin, 1990

1X Perfusion emergency and incidents management

OBJECTIVE: It is designed to provide the working knowledge of cardiopulmonary bypass which is essential foundation for their clinical studies

UNIT 1: emergency conditions

Heart attack, stroke, irregular heart beat, blood clot, blood loss, hypovolemic shock, breathing difficulties, heart block.

UNIT 2: E.C.G.

E.C.G unit, electrical activity of heart, normal and abnormal ECG readings, Holter monitor.

UNIT 3: Defibrillator

Defibrillator unit, positioning of paddles, conduction system of heart, heart blocks and pacemaker.

Hypothermia, Circulatory arrest and haemostatic management

UNIT 4: respiratory support

Ventilators, types of ventilators, manual hyperinflation, intubation.

UNIT 5: Haemodynamic support

Haemodynamic monitoring, arterial blood pressure monitoring, cardiac output monitor, blood transfusion, anticoagulation techniques.

References

ECMO specialist training Manual; Billie Lou Short M.D., Lisa Williams MHA,2009

Emergency medicine; Anthony F.T. Brown, Micheal D. Cadogan

Oxford handbook of Emergency Medicine; Jonathan P. Wyatt, 2012