REGULATIONS 2016

SYLLABUS

for Courses affiliated to the

Kerala University of Health Sciences

Thrissur 680596

BACHELOR OF SCIENCE IN

PERFUSION TECHNOLOGY

Course Code: 015

(2016-17 Academic year onwards)

2016

2. COURSE CONTENT

2.1 Title of the course

Bachelor of Science in Perfusion Technology

(BSc. Perfusion technology)

2.2 Objectives of the Course-

Perfusion Technology degree course is to provide a competent Cardiac Perfusionist who is well versed with modern technologies and up to date knowledge in patient care.

A **perfusionist**, also known as a **clinical perfusionist** or a **cardiovascular perfusionist**, is a specialized healthcare professional who uses the heart-lung machine during cardiac surgery and other surgeries that require cardiopulmonary bypass to manage the patient's physiological status.The perfusionist is a highly trained member of the cardiothoracic surgical team which consists of cardiac surgeons, anesthesiologists, physician assistants, surgical technologists, and nurses. The perfusionist is solely responsible for the management of the physiological and metabolic needs of the cardiac surgical patient so that the cardiac surgeon may operate on a still, unbeating heart. This is accomplished through the utilization of the heart-lung machine, oxygenator, filters, reservoirs and tubing. The perfusionist is responsible for the management of circulatory and respiratory functions of the patient so that the cardiac surgeon can focus on the actual surgical procedure. Other responsibilities include autologous blood collection and processing, implementation and management of the intra-aortic balloon pump, adult and infant extracorporeal membrane oxygenation (ECMO), monitoring of anticoagulation, electrolyte, acid-base balance and blood-gas composition,placing and managing patients on ventricular assist devices as bridge to recovery or heart transplantation and supporting patients receiving lung or liver transplants and in procurement of cardiothoracic donor organs for transplantation

Cardiovascular Perfusion Technology involves the study of physiology, pathology and associated equipment used to support and/or assume the function of the heart and/or lungs during medical procedures. The perfusion technologist prepares and operates the heart-lung machine and other sophisticated equipment as directed

by healthcare physicians. The perfusionist measures various blood and other parameters to identify appropriate mechanical, pharmacological and thermal manipulation to maintain tissue viability. To perform these tasks the perfusionist must have a thorough understanding of the both respiratory and circulatory systems and be able to operate complex equipment. Additionally the perfusionist must be capable of handling stressful situations, pay great attention to detail, communicate effectively, and be willing to stay abreast of new developments in the profession

This course is to provide a framework to guide safe and effective cardiopulmonary bypass (CPB). Clinical teams implement the content of this document when developing institution-specific protocols for patients undergoing cardiac surgery utilizing CPB.

A Perfusionist shall conduct cardiopulmonary bypass in compliance with departmental protocols. A patient-specific management plan for the cardiopulmonary bypass (CPB) procedure shall be prepared and communicated to the surgical team either during the pre- operative briefing or prior to beginning the procedure.The perfusionist should participate in the post-procedure debrief with the surgical team.

The mission of the KUHS is to encourage and foster the development of the profession of clinical perfusion through education and certification, so as to provide optimum patient care. A perfusionist shall recognize that the term “professional ethics” incorporates a commitment to service, to competent practice and to consistent development for the benefit of the community. This code shall guide the conduct of the perfusionist in all circumstances. Perfusionist who has successfully completed an accredited educational program and has successfully taken the examinations set by KUHS and BSc Perfusion Technology Degree will be awarded to them.

The **goals** of the Degree are diverse and include: -development of professional standards for perfusion - enhancement of perfusion scope of practice - development of continuing education programs on national and regional levels -

support of educational programs for entering perfusionists - scientific dissemination of knowledge

2.3 Medium of Instruction

The medium of instruction for the course shall be English.

2.4 Course outline

As given in curriculum

2.5 Duration

Duration shall be for a period of four years including one year internship training.

2.6 Subjects

As given curriculum

2.7 Total number of hours

The number of hours of teaching theory and practical subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Table - I Distribution of Teaching Hours in First Year Subjects

Main Subjects

SL NO	Subject	Theory No Of Hrs	Practical No Of Hrs	Total No. of Hours
1	Human Anatomy	70	20	90
2	Physiology	70	20	90
3	Biochemistry	70	20	90
4	Pathology-[Clinical pathology, Haemotology & Blood –Banking]	70	20	90
5	Microbiology	70	20	90
	Total	350	100	450

The classes in main subjects are to be held from Monday to Thursday. On Fridays and Saturdays students shall work in hospitals in the respective specialty or department chosen by them

Clinical/Lab posting -470Hours- Fri day 9am - 1pm and 2pm - 4-30 pm

Saturday 9am - 1pm

Table - II Distribution of Teaching Hours in Second Year Subjects

Main Subjects-No of hrs

SL NO	Subject	Theory	Practical	Clinical Posting	Total Hours
1	Medicine relevant to	50	-	-	50
2	Section A Applied Pathology	30	30	- -	60
3	Section B Applied Microbiology	30	30		60
4	Applied Pharmacology	50	-		50
5	Introduction to Perfusion Technology	80	100	650	830
	Total	240	160	65	1050

Table -III Distribution of Teaching Hours in Third Year Subjects

Main Subjects-No of hrs

S L No	Subjec	Theory	Practical	Clinical posting	Tota l
1	Perfusion Technology – Clinical	50	50	250	350

2	Perfusion Technology – Applied	50	50	25	350
3	Perfusion Technology –	50	50	25	350
	Total	150	150	750	1050

2.8 Branches if any with definition

Not applicable

2.9 Teaching Learning methods

- Lecture and practical classes
- During the internship year the candidates should do 5 months of internship is in an external institute (approved by KUHS) and the remaining 5 months in the parent institute.

2.10 Content of each subject in each year

ANATOMY

No. of theory classes: 70 hours

No. of practical classes: 20 hours

1. **Introduction:** human body as a whole

Theory:

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

Practical: Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

2. Locomotion and support

Theory:

Cartilage - types with example & histology

Bone - Classification, names of bone cells, parts of long bone, microscopy of compact bone,

Names 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

Names of muscles of the body

Practical: Histology of the 3 types of cartilage

Demo of all bones showing parts, radiographs of normal bones & joints

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

Histology of skeletal (TS & LS), smooth & cardiac muscle

3. Cardiovascular system

Theory:

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- cisterna chyli & thoracic duct

Histology of lymphatic tissues

Names of regional lymphatics, axillary and inguinal lymph nodes in brief

Practical: Demonstration of heart and vessels in the body

12 Histology of large artery, medium sized artery & vein, large vein

Microscopic appearance of large artery, medium sized artery & vein,

Large vein pericardium

Histology of lymph node, spleen, tonsil & thymus

Normal chest radiograph showing heart shadows

Normal angiograms

4. Gastro-intestinal system

Theory:

Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)

Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas

Radiographs of abdomen

5. Respiratory system

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments

Histology of trachea, lung and pleura

Names of paranasal air sinuses

Practical: Demonstration of parts of respiratory system.

Normal radiographs of chest

Histology of lung and trachea

6. Peritoneum

Theory: Description in brief

Practical: Demonstration of reflections

7. Urinary system

Kidney, ureter, urinary bladder, male and female urethra

Histology of kidney, ureter and urinary bladder

Practical: Demonstration of parts of urinary system

Histology of kidney, ureter, urinary bladder

Radiographs of abdomen-IVP, retrograde cystogram

8. Reproductive system

Theory:

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

Practical: Demonstration of section of male and female pelves with organs in situ

Histology of testis, vas deferens, epididymis, prostate, uterus,

Fallopian tubes, ovary

Radiographs of pelvis - hysterosalpingogram

9. Endocrine glands

Theory:

Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland,

Suprarenal gland - (gross & histology)

Practical: Demonstration of the glands

13 Histology of pituitary, thyroid, parathyroid, suprarenal glands

10. Nervous system

Theory:

Neurons, 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

Practical: Histology of peripheral nerve & optic nerve

Demonstration of all plexuses and nerves in the body

Demonstration of all part of brain

Histology of cerebrum, cerebellum, spinal cord

11. Sensory organs:

Theory:

Skin: Skin-histology, Appendages of skin

Eye: parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply

Ear: parts of ear- external, middle and inner ear and contents

Practical: Histology of thin and thick skin

Demonstration and histology of eyeball

Histology of cornea & retina

12. Embryology

Theory:

Spermatogenesis & oogenesis

Ovulation, fertilization

Fetal circulation

Placenta

Theory

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	6	6 x 5	30
Short Answer (SA)	10	10 x 3	30
Total Marks			80

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Anatomy

1. William Davis (P) understanding HumanAnatomy and Physiology MC Graw Hill

2. Chaursia -A Text book of Anatomy

T.S. Ranganathan - A text book of Human Anatomy

3. Fattana, Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore - 1991

4. ESTER. M. Grishcimer, Physiology & Anatomy with PracticalConsiderations, J.P. Lippin Cott. Philadelphia

5. Essential of Human embryology, Bhatnagar revised edition, Orient Longman PVT Ltd.

PHYSIOLOGY

Theory 70 hours

Practical 20hours

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 count, morphology functions.

Plasma Proteins - Production, concentration, types, albumin, globulin, Fibrinogen, Prothrombin, Functions.

Haemostasis & Blood coagulation

Haemostasis - Definition, normal haemostasis, clotting factors, mechanism of clotting, disordersof clotting factors.

2. Blood Bank

Blood groups - ABO system, Rh system, Blood grouping & typing, Crossmatching

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

3.Anaemias: Classification - morphological and etilogical. Effects of anemia on body

Blood indices - Colour index, MCH, MCV, MCHC

Erythrocyte sedementation Rate (ESR) and Paced cell volume, Normal values, Definition. Determination,

4. Blood Volume -Normal value, determination of blood volume and its regulation

Body fluid - pH, normal value, regulation and variation

Lymph - lymphoid tissue formation, circulation, composition and function of lymph

5. 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.

Pulse - Jugalar, radial pulse, Triple response

Heart sounds - Normal heart sounds, cause characteristics and signification. Heart rate

Electrocardiogram - (ECG) -significance.

6. Digestive System - Physiological anatomy of Gastro intestinal tractand its functions

Salivary glands-Stucture and functions. Deglutination -stages and regulation

Stomach - structure and fuctions

Gastric secretion - Composition function regulation of gastric juice secretion

Pancrease - structure, function, composition, regulation of pancreatic juice

7. Liver - functions of liver, Bile secretion, composition, function regulation of bile secretion .Bilirubin metabolism types of bilirubin, Vandernberg reaction, Jaundice- types, and significance.

Gall bladder - functions

Intestine - small intestine and large intestine

Small intestine -Functions- Digestive, absorption, movements.

Large intestine - Functions, Digestion and absorption of Carbohydrates, Proteins, Fats, Lipids.Defecation

8. 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 thelungs. 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.

9. Lung volumes and capacities

Regulation of respiration what? Why? How? Mechanisms of Regulation, nervous and chemical regulation. Respiratory centre. Hearing Bruer Reflexes.

Applied Physiology and Respiration: Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.

10. Endocrine System - Definition Classification of Endocrine glands & their Harmones Properties of Harmones.

Thyroid gland hormone - Physiological, Anatomy, Hormone scerated, 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 of blood glucose level

Parathyroid gland - function, action, regulation of secretion of parathyroid hormone.

Calcitonin - function and action

11. 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.

12. Nervous system

Functions of Nervous system, Neurone structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors 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-funtions. EEG.

Cerebro Spinal Fluid (CSF): formation, circulation, properties, composition and functions lumbar puncture.

Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions and comparison of functions.

13 Excretory System, Excretory organs

Kidneys**:** Functions of kidneys structural and functional unit nepron, vasarecta, cortical and Juxtamedullary nephrons - Comparision, Juxta Glomerular Apparatus -Structure and function. Renal circulation peculiarities.

Mechanism of Urine formation: Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption - sites of reabsorptionsubstance reabsorbed, mechanisms of reabsorption Glucose, and urea.

H + Cl aminoacids etc. TMG, Tubular lead, renal threshold % of reabsorption of different Substances, selective e secretion.

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

Mechanism of urine concentration.Counter - Current Mechanisms: Micturition, Innervation of Bladder, Cysteurethrogram.

Diuretics: Water, Diuretics, osmotic diuretics, artificial kidney renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests

14 Reproductive system

Function of Reproductive system, Puberty, male reproductive system. Functions of testes, Spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes Androgens - Testosterone structure and functions. Female reproducive syustem. Ovulation, Menstrual cycle. Physiological changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation.

15 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 contraction muscle tone, fatigue Rigour mortis

16 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.

Practicals

Haemoglobinometry

White Blood Cell count

Red Blood Cell count

Determination of Blood Groups

Leishman's staining and Differential WBC count

Determination of packed cell Volume

Erythrocyte sedimentation rate [ESR]

Calculation of Blood indices

Determination of Clotting Time, Bleeding Time

Blood pressure Recording

Auscultation for Heart Sounds

Artificial Respiration

Determination of vital capacity

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Physiology

1. Guyton (Arthur) Text Book of Physiology.

Latest Ed. Prism publishers

2. Chatterjee (CC) Human Physiology Latest Ed.

Vol-1, Medical Allied Agency

3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,

4. Ganong

BIOCHEMISTRY

1. Carbohydrates

-Classification and reactions of carbohydrates

-Metabolism of carbohydrate

-Glycolysis, Gluconeogenesis,

-Significance of HMP shunt pathway,

-Glycogen metabolism, regulation of blood glucose

-Diabetes mellitus –classification, metabolic derangement, complication and monitori

2. Lipids

-Classification of lipids, Biomembrane, importance of PUFA

-Metabolism of lipids

-Oxidation of fatty acids, synthesis of fatty acids, cholesterol, lipoproteins, dyslipidemias

3. Proteins.

-Structure of protein with examples, Classification of amino acids

-Compounds formed from amino acids,

-inborn errors of metabolism of amino acids

4. Enzymes.

-Classification, Kinetics, enzyme inhibition, regulation of enzyme action, clinical enzymology

5. Acid base balance.

-Regulation of normal blood pH, derangements in acid base status, compensatory mechanisms, anion-gap, arterial blood gas analysis.

6. Water and Electrolyte balance

7. Hemoglobin.Synthesis of heme, porphyria, degradation of heme, Jaundice.

8. LFT, RFT

9. Vitamins.-Fat soluble vitamins, water soluble vitamins

10. Minerals.Calcium and Iron in detail, selenium, copper, zinc, Phosphorus

PRACTICALS

1. Analysis of Normal Urine

2. Composition of urine

3. Procedure for routine screening

4. Urinary screening for inborn errors of metabolism

5. Common renal disease

6. Urinary calculus

7. Urine examination for detection of abnormal constituents

8. Interpretation and Diagnosis through charts

9. Liver Function tests

10. Lipid Profile

11. Renal Function test

12. Cardiac markers

13. Blood gas and Electrolytes

14. Estimation of Blood sugar, Blood Urea and electrolytes

15. Demonstration of Strips

16. Demonstration of Glucometer

Internal Assessment

Theory - Average of two exams conducted. 20 marks

Practicals: Record & Lab work* 10 marks

* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

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NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Biochemistry

1. Varley - Clinical chemistry

2. TEITZ - Clinical chemistry

3. Kaplan - Clinical chemistry

4. Ramakrishna(S) Prasanna (KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay -1980

5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students, Latest Edition

6. DAS (Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta - 1992

7. Text Book of Medical Biochemistry - 3rd Edition, Orient Longman PVT Ltd

8. Practical Biochemistry for Medical Students - Rajagopal, Orient Longman PVT Ltd

PATHOLOGY

Histo Pathology, Clinical Pathology, Haematology and Blood Banking

Theory - 70 hours

Practical - 20 hours

HistoPathology - Theory

- 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
- Bio-Medical waste management

Clinical Pathology - Theory

- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical specimens
- Urine Examination - Collection and Preservation of urine.

Physical, chemical, Microscopic Examination

- Examination of body fluids.
- Examination of cerebro spinal fluid (CSF)
- Sputum Examination.
- Examination of feces

Haematology - Theory

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV
- ESR
- Normal Haemostasis

-Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.

-Blood Bank-Introduction-Blood grouping and Rh Types-Cross matching

PRACTICALS

- Urine Examination.
- Physical, Chemical, Microscopy
- Blood Grouping Rh typing.
- Hb Estimation, PCV, ESR, Bleeding Time, Clotting Time.

- Histopathlogy - Section cutting and H &E Staining.

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type ofquestions and marks for Pathology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Pathology

1. Culling Histopathology techniques

2. Bancroft Histopathology techniques

3. Koss - cytology

4. Winifred greg - Diagnostic cytopathology

5. Orell - Cyto Pathology

6. Todd & Sanford Clinical Diagnosis by laboratory method

7. Dacie & Lewis - Practical Haematology

8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi -1996)

9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi - 1998

10. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.

11. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P. Bros, New Delhi-

MICROBIOLOGY

Objective: - This course introduces the principles of Microbiology with emphasis on applied aspectsof Microbiology of infectious diseases particularly in the following areas

- Principles & practice of sterilization methods.

-Collection and despatch of specimens for routine microbiological investigations.Interpretation of commonly done bacteriological and serological investigations.

-Control of Hospital infections

-Biomedical waste management

-Immunization schedule

Theory - 70 hours

1. Morphology 4 hours

Classification of microorgaisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

2. Growth and nutrition 4 hours

Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

3. Sterilisation and Disinfection 4 hours

Principles and use of equipments of sterlization namely Hot Air oven, Autoclave and serum Inspissrator. Pasteurization, Anti septic and disinfectants.

Antimicrobial sensitivity test

4. Immunology 6 hours

Immunity Vaccines, Types of Vaccine and immunization schedule Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg (Technical details to be avoided)

5. Systematic Bacteriology 20 hours

Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (the classification, antigenic structure and pathogenicity are not to be taught) Staphyloccci, Streptococci, Pneumococci, Gonococci, Menigococci, C diphtheriae,Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, Esch coli, Klebsiella, Proteus, vibrio cholerae, Pseudomonas & Spirochetes

6. Parasitology 10 hours

Morphology, life cycle, laboratory diagnosis of following parasites E. histolytica, Plasmodium, Tape worms, Intestinal nematodes

7. Mycology 4 hours

Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi.

8. Virology 10 hours

General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

9. Hospital infection Causative agents, transmission methods, investigation, prevention and control of Hospital infection. 4 hours

10. Principles and practice Biomedical waste management 4 hours

Practical 20 hours

Compound Microscope.

Demonstration and sterlization of equipments - Hot Air oven, Autoclave, Bacterial filters.

Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chacolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium Tellurite media with growth, Mac with LF & NLF, NA with staph Antibiotic susceptibility test

Demonstration of common serological tests - Widal, VRDL, ELISA.

Grams stain

Acid fast staining

Stool exam for Helminthic ova

Visit to hospital for demonstration of biomedical waste mangement.

Anaerobic culture methods.

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology shall be as given under.

TYPE OF QUESTION	**NUMBER OF QUESTIONS**	**MARKS**	**SUB-TOTAL**
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Microbiology

1. Anathanarayana & Panikar Medical Microbiology

2. Roberty Cruckshank - Medical Microbiology - The Practice of Medical Mircrobiology

3. Chatterjee - Parasitology - Interpretation to Clinical medicine.

4. Rippon - Medical Mycology

5. Emmons - Medical mycology

6. Basic laboratory methods in Parasitology, 1st Ed, J P Bros, New Delhi - 199

7. Basic laboratory procedures in clinical bacteriology, 1st Ed, J P Brothers, New Delhi.

II YEAR BSc DEGREE PERFUSION TECHNOLOGY SYLLABUS

APPLIED PHARMACOLOGY

• General concepts about pharmacodynamic and Pharmacokinetic Principles involved in drug activity.

I. Autonomic nerves system.

• Anatomy & functional organisation.

• List of drugs acting an ANS including dose, route of administration, indications, contra indications and adverse effects.

II. Cardiovascular drugs- Enumerate the mode of action, side effects and therapeutic uses of the following drugs.

a. Antihypertensives

• Beta Adrenergic antagonists

• Alpha Adrenergic antagonists

• Peripheral Vasodilators

• Calcium channel blockers

b. Antiarrhythmic drugs

c. Cardiac glycosides

d. Sympathetic and nonsympathetic inotropic agents.

e. Coronary vasodilators.

f. Antianginal and anti failure agents

g. Lipid lowering & anti atherosclerotic drugs.

h. Drugs used in Haemostais - anticoagulants Thrombolytics and antithrombolytics.

i. Cardioplegic drugs- History, Principles and types of cardioplagia.

j. Primary solutions - History, principles & types.

k. Drugs used in the treatment of shock.

III. 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.

IV. Analgessics

• Definition and classification• Routes of administration, dose, frequency of administration, Side effects and management of non opioid and opiod analgesics

V. Antihistamines and antiemetics-• Classification, Mechanism of action, adverse effects, Preparations, dose and routes and administration.

VI. CNS stimulants and depressants

• Alcohol

• Sedatives, hypnotics and narcotics

• CNS stimulants

• Neuromuscular blocking agents and muscle relaxants.

VII. Pharmacological protection of organs during CPB

VIII. Inhalational gases and emergency drugs.

IX. 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.

X. Corticosteroids - Classification, mechanism of action, adverse effects and complications.Preparation, dose and routes of administration.

XI. Diuretics

• Renal physiology

• Side of action of diuretics

• Adverse effects

• Preparations, dose and routes of administrion.

XII. Chemotherapy of infections

• Definition

• Classification and mechanism of action of antimicrobial agents

• Combination of antimicrobial agents

• Chemoperophylaxis.

• Classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, antitubercular drugs.

XIII.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.

PRACTICALS:

1. Preparation and prescription of drugs of relevance.

2. Experimental pharmacology directed to show the effects of commonly used drugs of relevance and Interpretation of few charts.

Scheme of Examination

Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for applied Pharmacology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

Recommended Books.

1. 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.

2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers

3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

APPLIED PATHOLOGY

I. CARDIOVASCULAR SYSTEM

- Atherosclerosis- Definition, risk factors, briefly Pathogenesis & morphology, clinical significance and prevention.
- Hypertension- Definition, types and briefly Pathogenesis and effects of Hypertension
- Aneurysms - Definition, classification, Pathology and complications.
- Pathophysiology of Heart failure
- Cardiac hypertrophy - causes, Pathophysiology & Progression to Heart Failure
- Ischaemic heart diseases- Definition, Types. Briefly Pathophysiology, Pathology & Complications of IHD
- Valvular Heart diseases- causes, Pathology & complication. Complications of artificialHeart valves.
- Cardiomyopathy - Definition, Types, causes and significance
- Pericardial effusion- causes, effects and diagnosis
- Congenital heart diseases - Basic defect and effects of important types of congenital heart diseases.

II. HAEMATOLOGY

- Anaemia - Definition, morphological types and diagnosis of anaemia.Brief concept about Haemolytic anaemia and polycythaemia.
- Leukocyte disorders- Briefly leukaemia, leukocytosis, agranulocytosis etc.

• Bleeding disorders- Definition, classification, causes & effects of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders.

III. RESPIRATORY SYSTEM

• Chronic obstructive airway diseases - Definition and types. Briefly causes, Pathology and complications of each type of COPD.

• Briefly concept about obstructive versus restrictive pulmonary disease.

• Pneumoconiosis- Definition, types, Pathology and effects in brief.

• Pulmonary congestion and edema.

• Pleural effusion - causes, effects and diagnosis.

IV. RENAL SYSTEM

• Clinical manifestations of renal diseases. Briefly causes, mechanism, effects and lab diagnosis of ARF & CRS. Briefly Glomerulonephritis and Pyelonephritis.

• End stage renal disease - Definition, causes, effects and role of dialysis and renal transplantation in its management.

• Brief concept about obstructive uropathy.

PRACTICALS

1. Description & diagnosis of the following gross specimens.

a. Atherosclerosis-

b. Aortic aneurysm.-

c. Myocardial infraction.-

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, AGN

3. Estimation of Hemoglobin.

4. Estimation Bleeding & Clotting time.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 50 marks. Distribution of type of questions and marks for Applied Pathology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	3	3 x 5	15
SHORT ANSWER (SA)	5	5 x 2	15
TOTAL MARKS			50

PRACTICAL EXAMINATION 40 Marks.

There will be a Combined Practical examination for Applied Pathology & Applied Microbiology.

Sl. No.	Tests	Marks
01	Interpretation of Hematology Chart	05
02	Interpretation of Urine Chart	05
03	Estimation of Hemoglobin	05
04	Estimation of Bleeding time & Clotting time	05
	Total	**20**

APPLIED MICROBIOLOGY

THEORY - 40 HOURS

1. Health care associated infections and Antimicrobial resistance: Infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting like Methicillin Resistant Staphylococcus aureus infections, Infections caused by Clostriduium difficle, Vancomycin resistant enterococci etc. Catheter related blood stream infections, Ventilator associated pneumonia, Catheter Related urinary tract infections, Surveillance of emerging resistance and changing flora. The impact and cost attributed to Hospital Associated infection. **6 Hours**

2. Disease communicable to Healthcare workers in hospital set up and its preventive measure: Occupationally acquired infections in healthcare professionals by respiratory route (tuberculosis, varicella-zoster, respiratory synctial virus etc), blood borne transmission (HIV, Hepatitis B, C, Cytomegalovirus, Ebola virus etc), oro faecal route (Salmonella, Hepatitis A

etc), direct contact (Herpes Simplex Virus etc). Preventive measures to combat the spread of theseinfections by monitoring and control. **6 Hours**

3. Microbiological surveillance and sampling: Required to determine the frequency of potential bacterial pathogens including Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis and also to assess the antimicrobial resistance.Sampling: rinse technique, direct surface agar plating technique.

6 Hours

4. Importance of sterilization:

a. Disinfection of instruments used in patient care: Classification, different methods, advantages and disadvantages of the various methods.

b. Disinfection of the patient care unit

c. Infection control measures for ICU's **10 Hours**

5. Sterilization:

a. Rooms: Gaseous sterilization, one atmosphere uniform glow discharge plasma (OAUGDP).

b. Equipments: classification of the instruments and appropriate methods of sterilization.

c. Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas.

8 Hours

6. Preparation of materials for autoclaving: Packing of different types of materials, loading, holding time and unloading.

4 Hours

PRACTICALS- 30 HOURS

1. Principles of autoclaving & quality control of Sterilization.
2. Collection of specimen from outpatient units, inpatient units, minor operation theater and major operation theater for sterility testing.
3. The various methods employed for sterility testing.
4. Interpretation of results of sterility testing.
5. Disinfection of wards, OT and Laboratory.

Scheme of Examination

Theory

There shall be one theory paper of three hours duration carrying 50 marks. Distribution of type of questions and marks for Applied Microbiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	4	4 x 5	20
SHORT ANSWER (SA)	5	5 x 2	10
TOTAL MARKS			50

PRACTICAL EXAMINATION 40 Marks

There will be a Combined Practical examination for Applied Pathology & Applied Microbiology.

No.	Tests	Marks
01	Dry heat / Moist heat: Temperature recording-charts interpretation	05
02	Dry heat / Moist heat: Colour change-indicators interpretation	05
03	Air sampling culture plates interpretation of Colony forming units based on air flow rate and sampling time	05
04	Interpretation of Sterility of Haemodialysis water/Distilled water /Deionised water based on growth of colonies in BHI agar to be reported as X CFU/mL	05
	Total	**20**

INTRODUCTION TO PERFUSION TECHNOLOGY

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**
- **History of Cardiac surgery and perfusion-**Specific reference of Gibbon Lillehei, carrel

• Pre CPB surgery

• Azygous Flow principle.

• Hypothermic/nonhypothermic non-CPB surgery including gross's Well technique and controlled cross circulation.

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• Haemotologic monitoring

• Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring

• Neurological monitoring (SSPE, EEG and cerebral function monitor)

• Aseptic technique.

• Cardiac surgery team, profession and terminology, scope of perfusion technology

Physiology of Extracorporeal circulation Heart - Lung machine

• Principles of extracorporeal circulation• Materials used in EC circuit

•Principles of extracorporeal gas exchange

47**Various types of oxygenators**

• Bubble oxygenators• Rotating spiral/cylinder/disc oxygenators

• Membrane oxygenators

• Mechanism of action components defoaming, rated flow.

Theory of blood pumps

• Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellow, sigmamotor, diaphragm, ventricular and centrifugal pumps.

Element of extracorporeal circulation/hazards of:

a. Blood failure

b. Bubble trap

c. Flow meters

d. Temperatures

e. Heat exchanger

f. Regulating devices

Connection of the vascular system with extracorporeal circulation:

• Arterial and venous cannulae.

• Connecting tubes and connectors

• Vents

• Suckers

• Cardioplegia delivery system

• Venous drainage.

Haemodynamic of arterial return, venous drainage, cardioplegia Delivery and venting.

Blood banking, handling of blood products and their management. Blood components and their use.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.

Distribution of type of questions and marks for Introduction to Perfusion Technology shall be as given under

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			**100**

PRACTICAL EXAMINATION 40 Marks

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-I Perfusion Technology Clinical

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 cardaiopulmonary 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 function of heat exchangers & their assessment. Complications related to heat exchange and their management

11. Priming fluids and hemodilution

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Paper-I - Perfusion Technology - Clinical shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			**100**

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical marks for each paper.

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-II Perfusion Technology – Applied

1. Blood cell trauma - analysis of forces of fluid motion, effects of physical forces o 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

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.

Distribution of type of questions and marks for Paper-II - Perfusion Technology Applied shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			**100**

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical marks for each paper.

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-III Perfusion Technology - Advanced

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, coagulpathies, 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

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.
Distribution of type of questions and marks for Paper-III - Perfusion Technology Advanced shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			**100**

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical Marks for each paper

2.11 No: of hours per subject

As given under clause "Content of each subject in each year "

2.12 Practical training

As given under clause "Content of each subject in each year "

2.13 Records

To be maintained for all Practical Work and duly signed by the supervising teacher should be submitted at the time of University practical examination

2.14 Dissertation:

Not Applicable

2.15 Speciality training if any

Cardiology, Nephrology, Blood Bank, Sterilization Room, Anesthesia etc according to the facility.

2.16 Project work to be done if any

Not Applicable

2.17 Any other requirements [CME, Paper Publishing etc.]

As per direction of HOD

2.18 Prescribed/recommended textbooks for each subject

Anatomy- Chaursia

Physiology-Chembulingam

Biochemistry-Vasudevan

☆

Microbiology- Ananthanarayanan

Pathology-Harsh Mohan

Pharmacology-Tripathi

Medicine- Davidson

Perfusion Technology- Gravlee

2.19 Reference books

Anatomy

1 William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill

2. Chaursia –A Text book of Anatomy T.S. Ranganathan – A text book of Human Anatomy

3. Fattana, Human anhiatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore – 1991

4. ESTER. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia

5. Essential of Human embryology, Bhatnagar revised edition, Orient Longman PVT Ltd .

Physiology

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers

2. Chatterjee(CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency

3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,

4. Ganong (William F) Review of Medical Physiology. Latest Ed. Appleton

Biochemistry

1. Varley – Clinical chemistry

1.TEITZ – Clinical chemistry

2. Kaplan – Clinical chemistry-Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980

3. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed

4. DAS(Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta
5. Text Book of Medical Biochemistry – 3rd Edition, Orient Longman PVT Ltd
6. Practical Biochemistry for Medical Students – Rajagopal, Orient Longman PVT Ltd

Pathology

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi –1996)
9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998 10.Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.
10. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P.

Microbiology

1. Anathanarayana & Panikar Medical Microbioloty
2. Roberty Cruckshank – Medical Microbiology – The Practice of Medical Mircrobiology
3. Chatterjee – Parasitology – Interpretation to Clinical medicine.
4. Rippon – Medical Mycology
5. Emmons – Medical mycology
6. Basic laboratory methods in Parasitology, 1st Ed, J P Bros, New Delhi – 199
7. Basic laboratory procedures in clinical bacteriology, 1st Ed, J P Brothers, New Delhi

2nd year Syllabus

APPLIED PHARMACOLOGY

Recommended Books.

1. 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.
2. 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.
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition

2.20 Journals

1. Annals of Thoracic surgery
2. Journal of Indian association of Perfusions
3. Journal of American Society of Extra corporeal Technicians
4. IACTS journal

2.21 Log book

To be maintained for all academic work which shall be counter signed by concerned HOD

3. EXAMINATIONS

3.1 Eligibility to appear for exams

The candidate must secure a minimum of 50% marks for internal assessment in theory and practical separately of a particular subject and minimum of 80% attendance in all subjects (theory and practical) in order to appear in the university examination

3.2 Schedule of regulars/supplementary exams

There will be two examinations in a year (regular and supplementary), to be conducted as per notification issued by university from time to time. Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates, within six months from the date of announcement of results.

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The particulars of the subjects for various examinations and distributions of marks are shown separately in the scheme of examination.

3.3 Scheme of Examination showing maximum marks and minimum marks

There shall be three regular examinations, one each at the end of I, II and III year. Distribution of Subjects and marks for First Year, Second year & Third year University theory and practical Examinations are shown in the Table - IV, V & VI.

First year examination:

The University examination for 1st year shall consist of only theory examination and there shall be no University Practical Examination.

Second & Third year examination:

The University examination for 2nd and 3rd year shall consist of
Written Examination & Practical.
Written Examinations consists of
04 papers in the 2nd Year
03 papers in the 3rd Year.

Practical examination:

Two practical examinations, at the end 2nd Year and three practical examinations at the end of the 3rd year.

TABLE-IV

Names of Subjects and Distribution marks

First Year Examination

Sl No	Main Subjects*	Written Paper		I .A Theory	Total
		Duration	Marks	Marks	Marks
1	Basic Anatomy [Including Histology]	3 hours	80	20	100
2	Physiology	3 hours	80	20	100
3	Biochemistry	3 hours	80	20	100
4	Pathology	3 hours	80	20	100
5	Microbiology	3 hours	80	20	100
	Total				**500**

Note: * I A = Internal Assessment

Main Subjects shall have University Theory Examination.

There shall be no University Practical Examination.

The candidate must secure a minimum of 50% marks for internal assessment in theory separately of a particular subject

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TABLE - V

Second Year Examination

		Theory				Practicals			
Paper	Subjects	Theory	Viva voce	IA	Sub Total	Practicals	IA	Sub Total	Grand Total
I	Section A – Applied Pathology 50 Section B - Applied Microbiology 50		30	20	150	40	10	50	200
II	Introduction to Perfusion Technology	100	30	20	150	40	10	50	200
III	Pharmacology	80	--	20	100	No Practicals			100
IV	Medicine relevant to Perfusion Technology	80	--	20	100	No Practicals			100
	Total								600

The candidate must secure a minimum of 50% marks for internal assessment in theory and practical separately of a particular subject

☆

TABLE –V1

Third Year Examination

		Theory				Practicals			Grand Total
Paper	subjects	Theory	Viva voce	I A	Sub Total	Practicals	I A	Sub Total	
I	Perfusion Technology – Clinical	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
II	Perfusion Technology – Applied	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
III	Perfusion Technology – Advanced	**100**	**30**	**20**	**150**	**40**	**10**	**50**	**200**
								150	**600**

Practicals-One common practical for all the three papers with equal weight age of marks i.e. 40 practical mark and 10 I.A. marks for each paper

☆

3.4 Papers in each year

As given under scheme of examination.

3.5 Details of theory exams

As given under 10 & 25

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

As per clause 3.3

3.6 Model question paper for each subject with question paper pattern

QP Code: **Reg. No.:.....**

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Basic Anatomy (Including Histology)

Time: 3hrs

Maximum marks: 80

Answer all questions

Draw diagrams wherever necessary

Essay (2x10=20)

1. Describe heart under the following headings:

ϒ Coverings ϒ Surfaces ϒ Arterial supply ϒ Right atrium ϒ Applied importance

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(2+2+2+3+1=10)

2. Describe right lung under the following headings:

ϒ Surfaces and borders ϒ Hilum ϒ Microscopy ϒ Broncho pulmonary segments

(2+2+3+3=10)

Short notes (6x5=30)

3.Kidney

4. Connective tissue cells

5. Skin

6. Spleen

7. Prostate

8. Uterus

Answer briefly (10x3=30)

9. Circle of Willis

10.Deltoid

11.Cornea

12.Transitional epithelium

13.Appendix

14.Fertilization

15.Gall bladder

16.Haversian system

17.Aorta

18. Left and right coronary artery

****

QP Code: **Reg. No.:.....**

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Physiology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Define coagulation of blood and name the coagulation factors. Explain the intrinsic mechanism of blood coagulation (1+4+5=10)
2. Define blood pressure and mention its normal values. What are the determinants of blood pressure. Add a note on regulation of stroke volume.

(2+3+5=10)

Short notes (6x5=30)

3. Plasma proteins
4. Heart sounds
5. Rh factor
6. Refractive errors
7. Factors affecting glomerular filtration rate
8. Action potential on a nerve and its ionic basis

Answer briefly (10x3=30)

9. Surfactant
10. Vital capacity
11. Cretinism
12. Triple response
13. E.S.R
14. Anticoagulants
15. Tests of ovulation

☆

16.Selection criteria of a blood doner

17.Hemoglobin

18. conducting system of heart

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QP Code: **Reg. No.:.....**

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Microbiology

Time: 3hrs

Maximum marks: 80

• Answer all questions

• Draw diagrams wherever necessary

Essay (2x10=20)

1. Define sterilization. List the different methods of sterilization and explain the principles involved in the functioning of autoclave and diagram. Mention the articles which can be sterilized by autoclave

(2+2+4+2=10)

2. Describe the clinical features, laboratory diagnosis, prophylaxis and treatment of tetanus

(3+3+4=10)

Short notes (6x5=30)

3. Hospital acquired infections

4. Bacterial growth curve

5. Infective endocarditis

6. Biomedical waste management

7. Hydatid cyst

8. Laboratory diagnosis of pulmonary tuberculosis

Answer briefly (10x3=30)

9. Differential staining

☆

10.Morphology of bacteria

11.Bacterial filers

12.Anaerobic culture methods

13.Hot air oven

14.Candidiasis

15.Enrichment media

16.Immunization schedule

17.Antiseptics

18. Antibiotic sensitivity testing

****

QP Code: Reg. No.:.....

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Pathology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Describe the microscopic examination of urine in detail
2. Explain the tissue processing for routine paraffin sections in detail

Short notes (6x5=30)

3. H & E staining
4. PCV
5. Normal haemostatic pathway
6. Stool examination
7. Classification of fixatives with examples
8. Mounting technique and various mountants used

Answer briefly (10x3=30)

9. Findings of CSF in TB meningitis.
10. Horning and stropping.
11. Sputum examination.
12. Prothrombin time
13. Biomedical waste
14. Differences between transudate and exudate
15. Normal constituents of blood.
16. Cross matching.
17. Different types of urine sample.

☆

18. Specific gravity estimation of urine.

****

QP Code: **Reg. No.:.....**

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Biochemistry

Time: 3hrs

Maximum marks: 80

• Answer all questions

• Draw diagrams wherever necessary

Essay (2x10=20)

1. Explain the Henderson – Hasselbach equation. Describe the important body buffers.

(6+4=10)

2. Define normality. Explain the preparation of exactly 0.1 N HCl solution by secondary titration procedure

(2+8=10)

Short notes (6x5=30)

3. Ionization of water

4. Anticoagulants

5. Principle, parts and use of colorimeter

6. Care and cleaning of glass wares

7. Centrifuge

8. Estimation of serum electrolyte

Answer briefly (10x3=30)

9. Lipid profile

10. Basal metabolic rate

☆

11.Pre analytical variables

12.Pauli's exclusion principle

13.Roth era's test

14. Blood urea estimation

15. Safety measures in the laboratory

16.Metabolic acidosis

17. pH meter

18. What is the normality of 12% NaOH solution

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QP Code: **Reg. No.:.....**

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Applied Pathology & Applied Microbiology

Time: 3hrs

Maximum marks: 100

• Answer all questions

• Draw diagrams wherever necessary

- Write Section A and Section B in Separate answer book (32 Pages). Do not mix up questions from Section A and Section B

SECTION A Applied Pathology 50

Essay (2x10=20)

1. Briefly describe the causes, mechanism, effects and laboratory diagnosis of acute renal failure

2. Define anemia. Mention the classification and diagnosis of anemia. What are the causes of haemolytic anemia. Short notes

(4x5=20)

3. Laboratory tests used to diagnose bleeding disorders.

4. Pneumoconiosis.

5. Pericardial effusion.

6. Pathophysiology of heart failure.

Answer briefly (5x2=10)

7. Risk factors of hypertension.

8. Pathogenesis of atherosclerosis.

9. Causes of cardio myopathy.

10. Classify congenital heart disease with suitable examples.

11. Pathology of mitral stenosis.

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SECTION B Applied Microbiology 50

Essay (2x10=20)

1. Briefly describe the health care associated infections.

2. Briefly describe the different methods of bio-medical waste management.

Short notes (4x5=20)

3. Mycobacterium tuberculosis.

4. Pseudomembranous colitis.

☆

5. Antibiotic sensitivity tests.

6. Emerging infections.

Answer briefly (5x2=10)

7. Passive immunisation.

8. Toxoids.

9. Antimicrobial resistance.

10. Normal flora of genito urinary tract.

11. Coliform count.

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QP Code: **Reg. No.:.....**

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Introduction to Perfusion Technology

Time: 3hrs

Maximum marks: 100

- Answer all questions
- Draw diagrams wherever necessary

Essay

(2x15=30)

1. Discuss the various types of oxygenators. What is an Ideal blood pump. Differentiate between pulsatile and non-pulsatile flow. Occlusive and non-occlusive pumps.

2. Describe the Principles of extracorporeal circulation. Discuss the Materials used in EC circuit. Explain the principles of extracorporeal gas exchange.

Short notes (5x7=35)

3. Haematological monitoring in CPB.

4. Bubble trap.

5. Connection of the vascular system with extracorporeal circulation.

6. Hazards of extra corporeal circulation.

7. Neurologic complications of CPB.

Answer briefly (7x5=35)

8. Azygous flow principle.

9. Controlled cross circulation.

10. Artificial heart valves.

11. Cardioplegia delivery system.

12. Management of hyperkalaemia.

13. Coronary vasodilators.

14. Anticoagulants.

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QP Code: **Reg. No.:.....**

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Pharmacology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Classify anti- hypertensive. Describe the mechanism of action, dosage, side effects, contra indications and uses of Metaprolol.

2. Classify general anaesthetics. Describe the pharmacokinetics and pharmaco dynamics of inhaled anaesthetic agents. Mention the uses and side effects of halothane.

Short notes (6x5=30)

3. Drugs used in metabolic and electrolyte imbalance

4. Immunosuppressive agents

5. Mechanism of action, dosage, side effects and route of administration of diuretics

6. Pharmacotherapy of bronchial asthma.

7. Classification, mechanism of action, adverse effects and complications of corticosteroids

8. Classification, spectrum of activity, routes of administration and adverse effects of Penicillin.

Answer briefly (10x3=30)

9. Advantages of enteral route of drug administration

10. First pass metabolism of drugs

11. Name 3 sympathomimetic drugs. Mention its uses

12. Name 3 cardiac glycosides .Mention its uses.

13. Management of digoxin toxicity.

14. Management of hyperkalaemia.

15. Coronary vasodilators.

16. Lipid lowering agents.

17. Anticoagulants.

18. Drugs used in the treatment of shock .

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QP Code: **Reg. No.:.....**

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Medicine Relevant to Perfusion Technology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Discuss rheumatic heart disease. Describe the pathology , clinical features, diagnosis and management of mitral stenosis.

2. Classify anti -hypertensive. How will you investigate a case of primary hypertension. What is malignant hypertension. .

Short notes (5x7=35)

3. Rheumatic carditis.

4. Aortic aneurism.

5. Management of pulmonary oedema.

6. Pharmacotherapy of bronchial asthma.

7. Anaemia.

Answer briefly (5x5=25)

☆

8. Coronary vasodilators.

9. Drugs used in the treatment of shock

10. Infective endocarditis.

11. Artificial heart valves.

12. Cardiac glycosides.

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Q.P. CODE: ---------- **Reg. No: .....**

Third Year B.Sc Perfusion Technology Degree Examinations, September2015

Paper-I Perfusion Technology Clinical

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays: (2×15=30)

1. A 62 years old man was diagnosed to have triple vessel disease. His height is 165cm, and weight 80 Kg. How will you proceed to conduct and monitor cardio pulmonary bypass?

2. Discuss the principles and methodology for termination of cardio pulmonary bypass.

Short notes: (5x7=35)

3. Pulsatile flow.

4. Cardioplegia.

5. Priming Fluids.

6. Complications of heat exchanger and its management.

☆

7. Haemodilution.

Answer briefly: (7x5=35)

8. Changes in Drug Pharmacokinetics due to CPB.

9. Controlled reperfusion.

10. Myocardial protection.

11. Bubble oxygenators.

12. Non -cardioplegic methods during cardiac surgery on CPB.

13. Adequacy of perfusion.

14. Amidarone.

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Q.P. CODE: ---------- **Reg. No: .....**

Third Year B.Sc Perfusion Technology Degree Examinations, September2015

Paper-II Perfusion Technology .Applied

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays: (2×15=30)

1. Discuss in detail inflammatory responses during cardiopulmonary bypass & its clinical effects. What are the methods to minimise them?

2. Discuss the principles of anticoagulation oncardio pulmonary bypass.How will you monitor and reverse heparin effect. What are its complications?

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Short notes: (5x7=35)

3. Modified ultra filtration.

4. Methods of blood conservation during cardiopulmonary bypass.

5. Priming fluids.

6. IABP.

7. Coagulopathies during CPB and its management.

Answer briefly: (7x5=35)

8. Prevention & treatments of Acute Lung Injury in CPB.

9. Thrombo elastogram.

10. Aprotinin.

11. Unusual problems in CPB.

12. Bivalirudin.

13. Management of protamine reaction.

14. Complications of blood transfusion.

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Q.P. CODE: ---------- **Reg. No: .....**

Third Year B.Sc Perfusion Technology Degree Examinations, September2015

Paper-III Perfusion Technology. Advanced

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays: (2×15=30)

1. Discuss the indications, contra-indications and complications associated with ECMO.

2. What are the complications during CPB? Describe how you will manage each complication.

Short notes (5x7=35)

3. Perfusion for minimally invasive cardiac surgery

4. Uses of CPB in non cardiac surgery

5. Special considerations in perfusion during cardiac surgery in infants.

6 .Spinalcord protection in aortic surgery.

7 .Recent advances in perfusion techniques.

Answer briefly: (7x5=35)

8. Measures to improve cardiac surgery teamwork.

9. Left heart bypass.

10. Myocardial protection and preservation for neonates and infants.

11. Milrenon.

12. Coronary angiogram.

13. Deep hypothermic circulatory arrest.

14.Non cardiac uses of CPB.

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3.7 Internal assessment Component

Minimum three internal assessment examinations of which the third one is University modal and mandatory, for theory and practical shall be conducted in each subject during a year and average marks of two best performances shall be taken into consideration for the award of internal marks. Marks of evaluation by other methods like assignments, seminars, projects etc. can be added to the internal marks. A candidate must obtain 50% of marks in internal assessment to be eligible to write the university examination. The class average of internal assessment marks of the whole class should not exceed 75% of maximum marks for regular examination and 80% for supplementary

examination both in theory and practical examination. The candidates who have failed to obtain the minimum internal marks should be given another chance to improve their internal assessment mark only before the next scheduled university examination. No improvement for internal examination.

3.8 Details of practical/clinical practical exams

As given under clause "Content of each subject in each year ".

3.9 Number of examiners needed [internal & External], and their qualification

Postgraduate Degree with 5 Years Post PG Teaching Experience in the same subject

3.10 Details of viva:

As given under clause "Content of subject in each year "

4. INTERNSHIP

4.1 Eligibility for internship

Only after passing the 3rd year examination the student will peruse internship.

The internship will consist of compulsory rotating practical training in the various subjects duly certified by the Head of department.

4.2 Details of Internship, Duration

One Year

Each student should undergo one month in Paediatric Surgery, One month in Thoracic Surgery, One month in Vascular Surgery. If any of these specialty is not available in the hospital where the candidate studied he/she may be send to the nearest reputed centre in Kerala for training

4.3 Model of Internship Mark lists

Nil

4.4 Extension rules:

- Any other leave other than eligible leave less than six months has to be compensated by extension granted by Principal.

- ***Extension of internship:*** Internship shall be extended by the number of days the student remains absent. These extended days of internship should be completed in the respective external/internal institution.

4.5 Details of Training given

Duration: The duration of internship will be for one academic year (10 months).

Internship posting: During the internship year the candidates may do 5 months of internship in an external institute (approved by KUHS) and the remaining 5 months in the parent institute.

Maintenance of records by students: Every student should maintain records of the number of hours of clinical work in different areas and institutions. This should be certified by the head of the institution or his/her nominee where the student is undergoing internship. The students should get the appraisal form duly filled by the supervisors in the respective institutions where they are undergoing internship and should be submitted to the parent institution in order to obtain internship completion certificate from the parent institutes

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution