DHANALAKSHMI SRINIVASAN UNIVERSITY

SAMAYAPURAM – 621112

SYLLABUS FOR BACHELOR OF SCIENCE IN CARDIO PULMONARY & PERFUSION TECHNOLOGY

HEALTH FOR ALL

CARDIO PULMONARY & PERFUSION TECHNOLOGY

I YEAR

S.NO	NAME OF THE SUBJECTS	TOTAL HOURS ALLOTTED
1.	ANATOMY & PHYSIOLOGY	60 HOURS
2.	BIOCHEMISTRY, PATHOLOGY	60 HOURS
3.	BASICS OF COMPUTER	30 HOURS
4.	CLINICAL	1000 HOURS

II YEAR

S.NO.	NAME OF THE SUBJECTS	TOTAL HOURS ALLOTTED
1.	PHARMACOLOGY, MICROBIOLOGY, PATHOLOGY	90 HOURS
2.	PRINCIPLES OF PERFUSION TECHNOLOGY	90 HOURS
3.	CLINICAL	1000 HOURS

III YEAR SUBJECT

S.NO	NAME OF THE SUBJECTS	TOTAL HOURS ALLOTTED
1.	INTRODUCTION TO SURGERY & CSSD	120 HOURS
2	CARDIO-PULMONARY BYPASS AND ITS COMPLICATIONS STERILE TECHNIQUES AND SURGICAL ASEPSIS MAINTENANCE	120 HOURS
3.	PRINCIPLES OF PERFUSION TECHNOLOGY (PART-II)	100 HOURS
4.	CLINICALS	1000 HOURS

Cardio Pulmonary & Perfusion Technology

SYLLABUS

FIRST YEAR

Paper-I Anatomy & Physiology

Paper-II Biochemistry, Pathology

Paper III Basics of Computer

SECOND YEAR

Paper-I Pharmacology, Microbiology, Pathology

Paper-II Principles of Perfusion Technology

THIRD YEAR

Paper-I Introduction to Surgery & CSSD

Paper-II Cardio-Pulmonary Bypass and its ComplicationsSterile Techniques and Surgical Asepsis Maintenance

Paper-III Principles of Perfusion Technology (Part-II)

ANATOMY

THEORY

Introduction to Anatomy

Basic Anatomical

terminology

Thorax – Inter-costal space, pleura, bony thoracic cage, ribs sternum & thoracic vertebrae

Lungs – Trachea, bronchial tree

Heart – Surface anatomy of heart, chambers of the heart, valves of the heart,major blood vessels of heart, pericardium, coronary arteries.

Excretory system – Kidneys**,** ureters,

bladderAnatomy of Liver & Kidney

PRACTICALS

Surface Anatomy

Radiology, X-ray Chest PA view

PHYSIOLOGY

THEORY

1) The Cell:

(i) Cell Structure and functions of the varies organelles.

(ii) Endocytosis and exocytosis

(iii) Acid base balance and disturbances of acid base balances(Alkalosis, Acidosis)

2) The Blood:

(i) Composition of Blood, functions of the blood and plasmaproteins, classification and protein.

(ii) Pathological and Physiological variation of the RBC.

(iii) Function of Hemoglobin

(iv) Erythrocyte Sedimentation Rate.

(v) Detailed description about WBC-Total count (TC), Differentialcount (DC) and functions.

(vi) Platelets – formation and normal level and functions

(vii) Blood groups and Rh factor

(viii) Clotting cascade – Physiology of hemostasis

3) Cardio-Vascular System:

(i) Physiology of the heart

(ii) Heart sounds

(iii) Cardiac cycle, Cardiac output.

(iv) Auscultatory areas.

(v) Arterial pressures, blood pressure

(vi) Hypertension

(vii) Electro cardiogram (ECG)

4. Respiratory system:

(i) Respiratory movements.

(ii) Definitions and Normal values of Lung volumes and Lungcapacities.

5. Excretory system:

(i) Normal Urinary output

(ii) Micturation

(iii) Renal function tests, renal disorders.

6. Central Nervous system:

Thermo regulation Glaxo como scale – Basic client reflexes

7. Endocrine system:

Basics of endocrine function and its tests

PRACTICALS

1) The compound Microscope
2) Determination of ESR-By Westergren's method
3) Determination of Blood Groups.
4) Measurement of human blood pressure.
5) Examination of Respiratory system to count respiratoryrate and measure inspiration and respiration

BIO-CHEMISTRY

THEORY

Carbohydrates
Glucose and Glycogen Metabolism

Proteins:
Classification of proteins and functions

Lipids:
Classification of lipids and functions

Enzymes:
Definition – Nomenclature – Classification – Factors affecting enzyme activity – Active site – Coenzyme – Enzyme Inhibition – Units of enzyme –Isoeznzymes – Enzyme pattern in diseases.

Vitamins & Minerals:
Fat soluble vitamins(A,D,E,K) – Water soluble vitamins – B-complex vitamins- principal elements(Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and sulphur) - Trace elements – Calorific value of foods –Basal metabolic rate(BMR) – respiratory quotient(RQ) Specific dynamic action(SDA) – Balanced diet – Marasmus – Kwasoirkar

Acids and bases:
Definition, pH, Henderson – Hasselbalch equation, Buffers, Indicators, Normality, Molarity, Molality

Serum

electroytes

PRACTICALS

1 Benedict's test
2. Heat coagulation tests

PATHOLOGY

THEORY

1. Cellular adaptation, Cell injury & cell death

- Introduction to pathology.
- Cellular response to stress and noxious stimuli.
- Cellular adaptations of growth and differentiation.
- Overview of cell injury and cell death.
- Causes of cell injury, Mechanisms of cell injury.
- Reversible and irreversible cell injury.Examples of cell injury and necrosis

2. Inflammation

- General features of inflammationHistorical highlights
- Acute inflammation
- Chemical mediators of inflammation
- Outcomes of acute inflammation
- Morphologic patterns of acute inflammation
- Summary of acute inflammation
- Chronic inflammation

3. Immunity disorders

- General features of the immune system
- Disorders of the immune system

4. Infectious diseases

- General principles of microbial pathogenesis
- Viral infections , Bacterial infections-Rheumatic heartdisease
- Fungal infections, Parasitic infections

BASICS OF COMPUTER

COURSE CONTENT:

Introduction to computer – I/O devices – memories – RAM and ROM – Different kinds of ROM – kilobytes. MB, GB their conversions – large computer – Medium, Micro, Mini computers – Different computer languages – Number system – Binary and decimalconversions – Different operating system – MS DOS – Basic commands – MD, CD, DIR,TYPE and COPY CON commands – Networking – LAN, WAN,MAN(only basic ideas)

Typing text in MS word – Manipulating text – Formatting the text – using different font sizes, bold, italics – Bullets and numbering – Pictures, file insertion – Aligning the text and justify – choosing paper size – adjusting margins – Header and footer, inserting pageNo's in a document – Printing a file with options – Using spell check and grammar – Find and replace – Mail merge – inserting tables in a document.

Creating table in MS-Excel – Cell editing – Using formulas and functions – Manipulatingdata with excel – Using sort function to sort numbers and alphabets – Drawing graphs and charts using data in excel – Auto formatting – Inserting data from other worksheets.

Preparing new slides using MS-POWERPOINT – Inserting slides – slide transition and animation – Using templates – Different text and font sizes – slides with sounds – Inserting clip arts, pictures, tables and graphs – Presentation using wizards.

Introduction to Internet – Using search engine – Google search – Exploring the next using Internet Explorer and Navigator – Uploading and Download of files and images – E-mail ID creation – Sending messages – Attaching files in E-mail – Introduction to "C" language – Different variables, declaration, usage – writing small programs using functions and sub – functions.

PRACTICALS

- Typing a text and aligning the text with different formats using MS-WordInserting a table with proper alignment and using MS-Word
- Create mail merge document using MS-word to prepare greetings for 10 friends Preparing aslide show with transition, animation and sound effect using MS Power-point
- Customizing the slide show and inserting pictures and tables in the slides using MS-power point
- Creating a worksheet using MS-Excel with data and sue of function
- Using MS-Excel prepare a worksheet with text, date time and data Preparing a chart and pie diagrams using MS-Excel
- Using Internet for searching, uploading files, downloading files creating e-mail IDUsing C language writing programs using functions
- Java, c+ Hoops – To prepare a Excel sheet and Video conference in CCTV footagereading.

FIRST YEAR

THEORY CLASSES

Subject	Theory (hrs)	Practicals (hrs)	Total Hrs.
Anatomy	40	20	60
Physiology	40	20	60
Pathology	40	20	60
Biochemistry	20	20	40
Computers	20	40	60
Total	**160**	**120**	**280**

O.T. in the mornings ... 15 hrs. /week

EXAMINATION FIRST YEAR

Paper-I Anatomy &

PhysiologyPaper-II Biochemistry,

Pathology

Paper III Basics of Computer * Internal Exam

EXAMINATION PATTERN; FIRST YEAR.

Sl. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min		
1.	Anatomy & Physiology	50	25	100	50	100	50	50	25
2.	Biochemistry & Pathology	50	25	100	50	100	50	50	25

Internal Paper:

1.	* Basics of Computer	50	25	100	50	----

* Computer is internal paper. Marks to be sent to the university. There will be no university examination for Computer paper.

Internal Assessment

Theory (20)	Practical (20)	Log Book/Project/Record(10)

* Wherever there is no Log Book/Project/ Record work the 10 mark be added to the Practical of therespective subject.

PHARMACOLOGY

Drugs affecting

(1) Blood

(2) Respiratory systemHormones of Pituitary and Thyroid

Insulin and Oral hypoglycemic

drugsAnti inflammatory drugs

UTI Drugs

Drug Interactions

Ionotropes	Hypokalemia
Diuretics	Hyperkalemia
Anticoagulants	Acidosis, Antiarrhythmic Agents, Alkalosis
Coagulants	Magnesium
Alpha Blockers	Calcium, Sodium,
Beta Blockers	Soda bicarbonate

Thorough knowledge of ABG, Serum electrolytes and its disturbances and corrections.

CLINICAL MICROBIOLOGY & PATHOLOGY-II

- Introduction
- Instruments and equipmentsMorphology of bacteria Stains
- Sterilization technique Decontamination Dryheat & moist heat
- Sterilization Chemical methodGaseous method Filtrations
- Drug resistance of bacteriaBasic principles in Immunology Antibody reactions Staphylococcus Streptococcus Enterococcus
- Wound infections UTI , RTI
- Blood stream infectionsGIT infections, Catheter related infections
- Hospital acquired infections and its preventionViral Hepatitis, HIV, HBC

No practicals.

PATHOLOGY

Pathology of the Heart

- Inflammatory diseases
- Non-inflammatory diseasesCongenital Heart disease

Pathology of Lung

- Revision of Anatomy, Physiology and EmbryologyCongenital and Inflammatory disease of Lung

Pathology of Kidney

- Nephrotic syndrome
- Acute Renal failure Chronic
- Renal failure
- Coronary Artery Diseases
- Rheumatic Tumors of Heart

PRINCIPLES OF PERFUSION TECHNOLOGY – PART-I

Physiology of Extra Corporeal Circulations

Heart Lung Machine Basics

Principles of Extracorporeal CirculationHistory Of Evolution Of Pump

Principles of Extracorporeal Gas Exchange

Various Types of Oxygenators – Bubble, Membrane

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

Elements Of Extracorporeal Circulation And ItsHazards Blood Filters

Bubble TrapFlow Meter

Temperature Probes

Heat Exchangers

Regulating Devices

Connections Of Vascular System And Extracorporeal Circulation

(1) Venous Drainage

(2) Suction Pump

(3) Hemodynamics of Arterial Reentry

(4) Arterial Infusion

(5) Cardiotomy Blood Return

1. Congenital Heart Diseases
2. Cardiac Disrhythmias, Heart Block
3. Drugs Used in Treatment of Blood Cardio VascularDisorders
4. Approach to Paediatric Patients

THEORY CLASSES:

	Theory	Practical	Total
Pharmacology	40	20	60
Pathology	40	20	60
Clinical Microbiology	40	20	60
Perfusion Technology (Part-I)	150	750 (OT training)	900
Total	270	810	1080 Hrs.

EXAMINATION PATTERN; SECOND YEAR.

Sl. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Pharmacology, Pathology, and Clinical Microbiology	50	25	100	50	100	50	50	25
2.	Principles of PerfusionTechnology – Part-I	50	25	100	50	100	50	50	25

PAPER-I

INTRODUCTION TO SURGERY

History of Surgery, role of the surgeon, importance of team work and anticipating the needs of surgeons; stresses that may arise during operative procedure; surgical terminology, types of incision and indications for the use of particular incision; Haemorrhage-signs and symptoms of internal and external; classification and management; identification of types of tourniquets-reasons for use and duration of application, dangers of use; Wounds, types, process of healing, treatment and complications; inflammation; wound infections – causes and treatment; incision and drainage of abscesses; importance of personal cleanliness and aseptic techniques;

Pre- operative and post-operative care of the surgical patient; Emergency procedures; Endotracheal intubation; Tracheostomy. Major symptoms of presentation in adults, Equipments used in wards, Common terms used in cardiology, Commonly used drugs and their action, Checking vitals – pulse, BP, respiratory rate, Establishing an IV line and Venepuncture, STERILE TECHNIQUES AND SURGICAL ASEPSIS – Preparation of neckline sets, cut down sets, etc. – Knowledge of surgical asepsis, skin preparation for invasive procedures

CSSD PROCEDURES

Course Contents

The development of CSSD, The growth of CSDD Aim and objectives of CSSD Topic: CSSD work practice, return of equipment and initial processing:-

Waste disposal collection of used items from user area, reception protective clothing and disinfections sage guards, use of disinfectionists sorting and classification of equipment for cleaning purposes, sharps, blunt lighted etc. contaminated high risk baby care – delicate instruments or hot care instruments, cleaning process – use of detergents. Mechanical cleaning apparatus, cleaning instruments, cleaning jars, receivers bowls etc.

trays, basins and similar hand were utensils. Cleaning of catheters and tubings, cleaning glass ware, cleaning syringes and needles. Drying inspection of instruments and needles instruments lubrications.

Topic: Assembly and packaging:-

Materials used for wrapping and packing assembling pack contents. Types of packs prepared. Inclusion of trays and galliparts in packs. Method of wrapping and making use of indications to show that a pack of container has been through a sterilization process date stamping.

Topic: Sterilization process

General observations principles of sterilization. Moist heat sterilization. Dry heat sterilization. EO gas sterilization. H2O2 gas plasma vapour sterilization.

a) Moist heal sterilization mechanism of biocardial action. Loading of sterilizer. Sterilization process unloading of sterilizer. Tests for efficiency of sterilization. Tests for pre vacuum porous load sterilizers.

b) Dry heat sterilization. Open system and closed system of dry heat sterilization. Packing and loading of sterilizer, sterilization process.

c) Sterilization by gaseous chemicals. Physical and chemical properties of E O and H2O2 plasma vapour absorption by natural and synthetic materials, toxicity, mechanism of biocidal action. Sterilization by 100% Ethylene oxide gas testing efficiency of sterilization.

d) Sterilization by Ironizing radiation units or terms. Mechanism of Biocidal action. Sterilization does installation of cobalt 60. Controls of safety precaution. Product sterility test. Product release. Application of radiation sterilization of medical equipment, pharmaceuticals and biological products, Industrial materials.

e) Aseptic filtration of liquids and air liquids: Types of filters depth of filters, membrane of filters, Testing efficiency of filtration. Integrating test application ofmembrane filtration. Pressure and vacuum filtration. Integrity test application of membrane filters. Pharmaceutical biological materials microbiological culture media. Sterility test. Aseptic filtration of air, fibrous depth filters. Mechanism of filtration. Granular carbon filtration fibrous (Paper) sheet filtration. Efficiency of HEPA filtration, Disinfection of used filters.

f) Chemical disinfection. Alcohols aldehydes, cholorapexidine, chlorine compounds, idophers phenols, strong oxidizing agents. Chlorine dioxide.

Peracetic acid. Peroxigen biocide hydrogen peroxide.

Topic: Principles of Chemical disinfection

Mechanism of microbiocidal action. Factors affecting in use effectiveness. Number oforganisms present. Conditions of grown. Conentration of disinfectant temperature. Temperature contract time presence of organic matter, surface of contact. Cellolous and synthetic materials. Contaminated disinfectants in the test. Evaluation of disinfectants, expression of disinfectant concentration. Bactericidate test. Test organisms Policy for disinfection in hospitals. Disinfection of hospital equipment. Disinfection of hospital environment. Disinfection of skin and mucous membrane. Administration of disinfection policy selection of disinfectants. Types of products.

Topic: Issue and Collection Techniques

Responsibilities of user department. Responsibility of CSSD equipment used for collection and issue. Techniques of collection and issue.

Topic: Infection control

Infection, cross infection control. Hospital policy manual regarding decontamination of articles, rooms, etc. Fumigration procedure.

PAPER-II

CARDIO-PULMONARY BYPASS & PERFUSION TECHNOLOGY

1. Haemodynamic aspects of total heart – Lung bypass
    - Perfusion flow pressure and resistance distribution of blood flow among variousvascular beds.
2. Metabolic aspects of total heart – Lung bypass Oxygen need and perfusion flowrequirements
    - Perfusion flow and oxygen uptake, Acid-base balance Electrolyte and water balanceOxygen toxicity
3. Effects of perfusion on organs
    - Brain, heart, lungs, kidney liver and spleen area and other organs
4. Control of adequacy of perfusion
    - The ideal perfusion, Monitoring devices Techniques of control
5. Hematological problems Blood primePriming solutions
    - Control of Effects of various priming solution on RBC trauma
6. Induced cardiac arrest and myocardial protection
    - Physiological principles of including cardiac arrest, morphology, function andmetabolism of the arrested heart Cardioplegia – Cold blood, potassium and Modified cold prime cardioplegia
7. Hypothermia
    - Blood stream cooling nerves peripheral cooling modes of blood stream coolingheart and circulation at low termprature
8. Assisted circulation
    - Circulatory support metabolic support by partial heart lung bypass. Effects ofpartial heart-lung bypass on organs.
9. Biomedicus pump
10. LV assist devices – LVAD, RVAD, BIVAD
11. Intra-aortic balloon pump – IABP
12. Autotransfusion, cell saver.

PAPER – III

CARDIO PULMONARY BYPASS AND COMPLICATIONS

Complications while initiating the bypass, during bypass and at the termination ofbypass. Hemolysis / haematuria / hemoglobinurea.

Air locking, air embolism.

Rewarming and cooling, cerebral damage.

Loss of electrical power – running a pump with hand rotation.

INVESTIGATIONS

Routine -Haematological – their significance

- Urine
- E.C.G.
- Chest X-ray
- Echocardiography
- Angiography
- Liver function test
- Renal function test
- Other

STERILE TECHNIQUES AND SURGICAL ASEPSIS

- Preparation and assembling of circuits on heart lung machine.
- Taking circuits from thesurgeons.
- Assembling filters.
- Knowledge of surgical asepsis, skin preparation for invasive procedures.

MAINTENANCE

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

Catheters used in Electrophysiology studies

Connection of Catheters during in EP study

Equipment used in arythmia, induction and mappingRadio frequency abalation

ECMO

Ventricular assist device

fundamentals of Pace maker

EXAMINATION PATTERN: THIRD YEAR.

Sl. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min		
1.	Introduction to Surgery& CSSD	50	25	100	50	100	50	50	25
2.	Cardio-Pulmonary Bypass & Perfusion Technology	50	25	100	50	100	50	50	25
3.	Cardio-Pulmonary Bypass and its Complications Sterile Techniques and SurgicalAsepsis Maintenance	50	25	100	50	100	50	50	25

POSTINGS DURING ONE YEAR INTERNSHIP

3 MONTHS – CATH LAB & BLOOD BANK

9 MONTHS - CARDIAC THEATRE