# DHANALAKSHMI SRINIVASAN UNIVERSITY
# SAMAYAPURAM – 621112


## SYLLABUS FOR BACHELOR OF SCIENCE IN CARDIO VASCULAR TECHNOLOGY

**HEALTH FOR ALL**

## CARDIO VASCULAR TECHNOLOGY

## I YEAR

| S.NO | NAME OF THE SUBJECTS | TOTAL HOURS ALLOTTED |
|---|---|---|
| 1. | ANATOMY, PHYSIOLOGY | 120 HOURS |
| 2. | BIOCHEMISTRY, PHARMACOLOGY | 60 HOURS |
| 3. | PATHOLOGY, MICROBIOLOGY | 60 HOURS |
| 4. | INTRODUCTION TOCOMPUTER APPLICATION, QUALITY ASSURANCE AND ACCREDITATION | 60 HOURS |
| 5. | ENGLISH | 60 HOURS |
| 6. | CLINICAL | 1000 HOURS |

## II YEAR

| S.NO. | NAME OF THE SUBJECTS | TOTAL HOURS ALLOTTED |
|---|---|---|
| 1. | CARDIAC ANATOMY & CARDIACPHYSIOLOGY | 60 HOURS |
| 2. | CARDIOVASCULAR TECHNOLOGY -CLINICAL | 60 HOURS |
| 3. | CLINICAL | 1000 HOURS |

## III YEAR SUBJECT

| S.NO | NAME OF THE SUBJECTS | TOTAL HOURS ALLOTTED |
|---|---|---|
| 1. | CARDIAC PATHOLOGY & CARDIAC PHARMACOLOGY | 60 HOURS |
| 2 | CARDIOVASCULAR TECHNOLOGY - APPLIED | 60 HOURS |
| 3. | CARDIOVASCULAR TECHNOLOGY - ADVANCED | 60 HOURS |
| 4. | CLINICAL | 1000 HOURS |

# Cardiovascular Technology
# Syllabus

## First year

Theory classes and practicals of following subjects

- Anatomy
- Physiology
- Biochemistry
- Pharmacology
- Microbiology
- Pathology
- Introduction to Computer application
- Quality Assurance & Accreditation English

**Second year**

Theory class and posting in the clinical area

- Cardiac Anatomy & Cardiac Physiology
- Cardiovascular Technology – Clinical

**Third year**

Theory class and posting in the clinical area

- Cardiac Pathology & Pharmacology
- Cardiovascular Technology – Applied
- Cardiovascular Technology – Advanced

**Fourth Year:**

Fourth year is internship in the clinical area

# FIRST YEAR

**Internal Assessment**

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks.

## Paper I –AANATOMY

**COURSE OBJECTIVE:**
An outline of anatomy with special emphasis on applied aspects is provided to thestudents for better understanding of the technical and diagnostic procedure.

**Course Outcome:**

- Knowledge of general anatomy and locomotion.
- Knowledge of basic human anatomy and histology of CVS and Respiratorysystems.
- Knowledge of basic human anatomy and histology of CNS, GI, excretory and reproductive systems.
- Knowledge of basic human anatomy and histology of endcorine system and special senses.

**1. The human body as a whole**

- Definition
- Sub divisions of anatomy
- Terms of location and positions
- Fundamental planes, Vertebrate structure of man
- Organization of body cells and tissues

**2. Locomotion and Support**

- The Skeletal SystemTypes of bones
- Structure and growth of bones Divisions of the skeleton Appendicular skeleton, Axial skeletonName of all the bones and their parts
- Joints: Classification, Types of movements with examples

**Muscles:** Structure, classification, muscles of abdominal wall, muscles ofRespiration, pelvic diaphragm, muscles of head and neck

**Practicals:**

- Demonstrations of all bones:Showing parts
  - Joints, X-rays of all normal bones and joints
  - Muscles: Classification of muscle

**3. Anatomy of nervous system**

- Introduction and divisions of nervous system
- Central nervous system: Spinal cord, Anatomy, and functions, Reflex arc

**The Brain**:

- Location, gross features, parts, functional areasHindbrain, Midbrain, fore brain
- Coverings of brain and peripheral nervous systemanatomy of cerebral blood supply& coverings
- Spinal cord –gross features, extent, blood supply and coveringsInjuries to spinal cord and brain
- Peripheral nervous system – organization& structure of a typical spinal nerve

**Practicals:**

Demonstration of brain and spinal cord

**4. Anatomy of Cardiovascular system**

**Gross anatomy & Structural features of the Heart and Great vessels:**

**Heart**

- Location, size, surface features, pericardium & valves
- Right Atrium :- structural features Venous area, Septum and atrial appendage
- Right Ventricle :- structural features, inflow & Out flow characteristics
- Left Atrium :- structural features, venous area, Septum and appendage
- Left ventricle :- structural features, inflow & out flow characteristics Valves:- valve apparatus, location Structure & functions of each valve
- Blood Supply of heart :- coronary arteries, cardiac cycle I
- nnervations :- sympathetic and parasympathetic sensory
- Pulmonary circuit-names of the arteries and veins & positions
- Lymphatic drainage of the Heart

**Great Vessels**

- Structure of blood vessels and its organization
- Aorta
- Pulmonary artery & pulmonary vein
- General plan of systemic circulation
- Pulmonary circulation

**Practicals:**

- Demonstration to illustrate normal angiograms.
- Demonstration of surface features & interior of the heart
- Demonstration of aorta and its branches
- Histology of cardiac muscles and artery

5. **Anatomy of the Respiratory system**
    - Organs of Respiratory System:
      Conducting portion, respiratory portion. (Nose –nasal cavity, paranasal air sinuses Larynx,trachea,bronchial tree)
    - Muscles of Respiration
    - Cross structure and the interior features of nose & nasal cavityPara nasal air sinuses
    - Cross structure and interior features of the pharynx and larynx
    - Cross structures and interior features of the trachea and bronchial tree
    - Gross structure, histology, position and coverings of the lungs
    - Pulmonary circulation – pulmonary arteries pulmonary veins & bronchial arteries Nerve supply to the respiratory system

**Practicals**

- Demonstration of the parts and function
- Demonstration of the different parts of the respiratory system with special em-phasis On lungs
- Histology of lungs

6. **Anatomy of the digestive system**
    - Components of the digestive system
    - Alimentary tube
    - Mouth, tongue, tooth
    - Salivary gland, liver, biliary apparatus and its secretion, pancreas and pancreatic
    - Secretion, movements of intestine defecation, GI hormones malabsoption

**Practicals**

- Demonstrations of the parts and functions
- Normal x-rays

7. **Anatomy of excretory system & Reproductive system**
    - Organization of the renal system
    - Kidneys: location, gross features, structure, blood supply and nerve supplyExcretory ducts, ureters, urinary bladder, urethra location gross features and Structure

**Male reproductive system:**

- Testis, Duct system,
- Prostate
- Female Reproductive system: Ovaries, duct system, accessory organs

**Practicals**

- Demonstration of Kidneys, ureter, bladder
- Histology of kidney

**8. Anatomy of endocrine system**

- Name of all endocrine glands and their positions
- Hormones and their functions

**9. Histology**

**General Slides:**

Hyaline cartilage, Fibro cartilage, Elastic cartilage, T.S & L.S of bone, Blood vessels, Tonsils, Spleen, Thymus, Lymph node, Epithelial tissue, Skeletal and cardiacmuscle, Peripheral nerve and optic nerve

**Systemic Slides**

- G.I.T
- Lung-Trachea
- Kidney, Ureter, Urinary bladder
- Endocrine- Adrenal,pancreas,pituitary,thyroid and parathyroid
- Uterus, Ovary, testis

**Reference books:**

**Human Anatomy- Regional and Applied Volume**

B.D Chaurasia

**Clinical Anatomy For Medical Students**

Richard S.Snell

## Paper I – Section B: PHYSIOLOGY

**Course outcome:**

1. CO1: Knowledge of general physiology, nerve-muscle physiology and haema-tology.
2. CO2: Knowledge of basic human physiology with respect to CVS, Respiratorysystem and GI system.
3. CO3: Knowledge of basic human physiology of excretion and CNS.
4. CO4: Knowledge of basic human physiology of special senses and endocrinesystem.

**1. INTRODUCTION TO PHYSIOLOGY AND GENERAL PHYSIOLOGY-1 hr**

**2. MUSCLE and NERVE - 3 hrs**

- Neurons and glial cells - Structure, function, Types, electrical property, dege- neration and regeneration.
- Muscle- Structure & Functions of skeletal muscle & smooth muscle
- Neuromuscular transmission – Functional anatomy, Transmission & Clinical importance.

**3. HAEMATOLOGY - 9 hrs**

- Fluid compartments, Composition & functions of blood, Plasma protein – names, functions.
- Erythrocyte - Morphology, Count, Function, Erythropoiesis, Factors affecting erythropoiesis, Structure of Haemoglobin, Erythrocyte Sedimentation rate, Anaemia, Polycythemia, Fate of RBC, Jaundice.
- Leucocytes - Morphology, Types, Properties & Functions, variations in count.
- Thrombocytes- Morphology, Count, Function, Variations.
- Hemostasis. Coagulation and its disorders.
- Blood groups and its importance, Blood transfusion.
- Tissue fluid and Lymph, Immunity.

**4. CARDIOVASCULAR SYSTEM - 10 hrs**

- Organisation of CVS, Properties of Cardiac Muscle, Origin and spread of car- diac impulse
- Cardiac Cycle – Electrical (ECG)and mechanical events,
- Cardiac output, Measurement, (Fick's Principle) regulation
- Blood pressure, measurement & variation, determinants, regulation, Shock.
- Regional circulation.(Salient features only)-coronary, Pulmonary, Cerebral,Cutaneous

**5. RESPIRATORY SYSTEM - 8 hrs**

- Introduction. Functional anatomy, Mechanics of ventilation, Pressure changes, volume changes, Surfactant, Compliance, Airway resistance.
- Alveolar ventilation, Dead space, Ventilation perfusion ratio and its signific- ance, Spirogram
- Diffusion of gases, $O_2$ transport, $CO_2$ transport.
- Regulation of respiration – Voluntary, Neural, Chemical.
- Abnormalities of respiration Hypoxia, Cyanosis, Dyspnea, Asphyxia, High alti-tude,
- Dysbarism.

**6. DIGESTIVE SYSTEM - 7 hrs**

- Functional anatomy of GI tract,
- Salivary secretion & its regulation, Gastric secretion and its regu-lation

- Peptic ulcer, Pancreatic secretion and its regulation, Functions of liver. Bile –storage and functions. Intestinal juice
- Movements - Mastication, Deglutition, Movements of stomach, Small intes- tine, Large intestine. vomiting, Defeacation.
- GI Hormones,
- Digestion & Absorption of carbohydrates, Proteins, Fat & vitamins

**7. Excretion - 7 hrs**

- Functional anatomy of kidney, Structure and function of kidney and nephron
- Renal blood flow, Glomerular filtration rate, Definition, Measurement & factors affecting Tubular functions – Reabsorption, Secretion, Acidification, concen- tration and abnormalities.
- Micturition – Bladder innervation, Micturition reflex.
- Functions of skin

**8. ENDOCRINOLOGY - 6 hrs**

- Introduction to endocrinology (Different glands, hormones)
- Pituitary gland ( Anterial and posterior glands, actions and applied aspects.
- Thyroid gland (Actions and applied aspects)
- Calcium homeostasis (Parathyroid, Vitamin D, Calcitonin, actions and appliedaspects
- Pancreas (Endocrine part – insulin, glucagon – actions and applied aspects f) Adrenal cortex and medulla (Actions and applied aspects)

**9. REPRODUCTIVE SYSTEM - 3 hrs**

- Male Reproductive System- Different parts, spermatogenesis, hormones
- Female reproductive system – Different parts, Sexual cycles – Menstrual cycles – Ovarian, endometrium
- Lactation, Pregnancy & Contraception (Basics only)

**10. CENTRAL NERVOUS SYSTEM** (Basics only) **- 10 hrs**

- Organization of Nervous system.
- Synapse, Properties & Function
- Reflexes, Reflex action, Property ,Function.
- Sensory system – Receptor, Ascending sensory pathway (basics only), Tha- lamus, sensory cortex
- Motor System – Spinal control of Motor activity, Motor areas in Cerebral Cor-tex
- Pyramidal & extra pyramidal tracts (basics only)
- Basal ganglia & Cerebellum.
- Hypothalamus
- Autonomous nervous system
- Cerebro spinal fluid- formation and functions.

**11. SPECIAL SENSES** (Basics only) **- 4 hrs**

- Audition
- Vision

**Reference books:**

**Essentials of Medical Physiology**
Anil Baran Singha Mahapatra

## Paper II Section A: BIOCHEMISTRY

**Course outcome:**

1. CO1: Knowledge of biochemistry of cell structure, functions, digestion, enzymes and protreins.
2. CO2: Knowledge of biochemistry of carbohydrates, minerals and vitamins.
3. CO3: Knowledge of biochmestry of liver and renal function tests, specialized la-boratory investigations and lipids.
4. CO4: Knowledge of biochemistry of metabolism, homeostasis, nucleic acids andcancer.

**I. CELL STRUCURE & FUNCTIONS**

- Mitochondria
- Endoplasmic reticulum, Lysosomes
- Fluid mosaic model for membrane structure

**II. DIGESTION AND ABSORPTION OF NUTRIENTS**

- Digestion of carbohydrates
- Fats
- Enzymes in digestion of proteins

**III. ENZYMES**

- Normal serum range and diagnostic importance of serum AST, ALP,ALT,CK,GGT and AMYLASE.

**IV. PROTEINS**

- Essential amino acids
- Plasma proteins
- Immunoglobulins

**V. CARBOHYDRATES**

- Diabetes mellitus- symptoms and complications
- Glucose tolerance test
- Action of insulin and glucagon on carbohydrate metabolism

**VI VITAMINS**

- Deficiency manifestations of Vitamin A, C, D, E, K
- Vit B Complex

**VII MINERALS**

- Factors maintaining serum calcium level and important functions ofcalcium
- Importance of trace elements

**VIII HEMOGLOBIN**

- Hemoglobin metabolism

**IX LIVER FUNCTION TESTS**

- Jaundice and types of jaundice
- Enzymes in liver disease

**X RENAL FUNCTION TESTS**

- Serum Creatinine

**XI SPECIALIZED LABORATORY INVESTIGATIONS**

Principle and applications of

- Radioimmunoassay (RIA)
- ELISA
- Colorimetry

**XII LIPIDS**

- Essential fatty acids (EFA)
- Poly unsaturated fatty acids (PUFA)
- Phospholipids

**XIII METABOLISM**

- TCA cycle (steps only)

**XIV MAINTENANCE OF HOMEOSTASIS**

- Plasma buffers
- Renal mechanisms in pH regulation
- Anion gap
- Metabolic acidosis,

**XV NUCLEIC ACIDS**

- DNA and RNA
- Purine and pyrimidine bases,

**XVI CANCER**

- Chemical and physical carcinogens
- Tumor markers.

**Reference books:**

**The Text Book of Biochemistry**
Dr. D.M.Vasudevan, Sreekumari.S

**Text Book of Biochemistry**
T.N.Pattabhiraman

**Essentials of Biochemistry**
U.Sathyanarayanan

## Paper II – Section B: PHARMACOLOGY

**Course outcome:**

- CO1: Basic knowledge in pharmacology.
- CO2: Detailed systemic pharmacology.
- CO3: Detailed knowledge of drugs and groups of drugs.

**Course**

- General Pharmacology
- Evaluation of drugs in man, drug prescribing and drug interactions
- Sedatives, hypnotics and pharmacotherapy of insomnia
- Drugs effective in convulsive disorders
- Opioid analgesics
- Analgesic – antipyretics and non-steroidal anti-inflammatory drugs
- Psychopharmacology
- Drug therapy of parksinsonism and other degenerative disorders of the brain
- Local anesthetics
- Adrenergic and adrenergic blocking drugs
- Histamine and anti histamic drugs
- Pharmacotherapy of cough
- Pharmacotherapy of bronchial asthma and rhinitis
- Digitalis and pharmacotherapy of cardiac failure
- Vasodilator drugs and pharmacotherapy of angina pectoris
- Pharmacotherapy of hypertension
- Drugs and blood coagulation
- Drugs effective in iron deficiency and other related anemias
- Diuretics Emetics, drug therapy of vomiting, vertigo and diarrhea
- Pharmacotherapy of constipation
- Pharmacotherapy of peptic ulcer
- Sulfonamides, Trimethoprim, cortimoxazole, nitrofurans and quinolones
- Penicillins and antibiotics effective mainly against gram positive organisms
- Amonoglycosides and other antibiotics effective mainly against gram negative organisms
- Antibiotics effective against both gram positive and gram negative organisms
- General principles of chemotherapy of infections
- Chemotherapy of urinary tract infections
- Antiseptics, disinfectants and insecticides
- Thyroid and antithyroid drugs
- Insulin and ant diabetic drugs
- Adrenal cortical steroids
- Vitamins and antitoxidants
- Drugs, pregnancy and the newborn

**Reference books:**

**Essentials of Medical Pharmacology**
Tripathi
**Basics and Clinical Pharmacology**
Katzung

## Paper III Section A: MICROBIOLOGY

**Course Outcome:**

- CO1: To understand the morphological characters of bacteria.
- CO2: To master the preparation of smear, fixation and staining of bacterial smears and its quality control methods
- CO3: Learn to use microscope , autoclave, hot air oven, water bath, steamer,filters
- CO4: To differentiate between innate and adaptive immunity, and explain the main defences lines as well as biological barrier to the infections.
- CO5: Employ antigen –antibody interaction to conduct different immunological and serological tests in the laboratory

Introduction to medical microbiology

- Morphology and physiology of bacteria
- Sterilization and disinfection
- Normal Microbial flora of the human body
- Infection
- Antibiotics
- Hospital infections and prevention
- Immunity
- Antigen, Antibody, Antigen-antibody reactions
- Immune response, Hypersensitivity , Immunoprophylaxis
- Tuberculosis
- Typhoid
- Virus infections
- HIV/AIDS
- Hepatitis viruses
- Medical Mycology , Medical Parasitology
- Malaria, Urinary Tract Infections
- Respiratory Tract Infections
- Gastrointestinal Infections
- Sexually Transmitted Disease
- Infections of the nervous system

**Practical Demonstrations**

- Gram Staining
- Acid Fast Staining
- Antibiotic Susceptibility Testing
- CSSD Visit
- Theory Class Hours
- Practical Demonstration hours

**Referrence books:**

**Text Book of Medical Paracytology**
C.K.Jayaram Panicker
**Text Book of Microbiology**
Anand Narayan

## Paper III – Section B: PATHOLOGY

**Course Outcome:**

1. CO1: Knowledge of general and systemic pathology.
2. CO2: Knowledge of pathology of neoplasms.
3. CO3: Knowledge of basics of community health.

## 1. Introduction to Pathology

- Histopathology- Methods and techniques
- Cytology-FNAC,Exfoliative advantages and limitations of cytology
- Hematology-Sample collection.
- Immunohistochemistry,Immunofluorescence, Electron microscopy,
- Flow cy-tometry

## 2. Cell injury & adaptations

- Etiology
- Reversible & - Irreversible cell injury
- Necrosis & Apoptosis
- Gangrene - Dry - Wet
- Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia.
- Fatty change

## 3. Inflammation & Repair

- What is inflammation
- Signs of inflammation, Acute and chronic inflammation, Types of inflamma-tion, Giant cells, Macrophages, Ulcer, abscess, Acute inflammation, Systemic effects of acute inflammation
- Factors affecting healing- Complications of healing

## 4. Hemodynamic Disorders

- Definition of edema and causes of edema
- Exudate and transudate

Shock – Definition and types of shockThrombosis

- Embolism- Definition and types of emboli
- Pulmonary thromboembolism

## 5. Neoplasia

- Definition
- Difference between benign and malignant cells, Nomenclature of tumors

  Routes of metastasis of tumours,- Staging of tumour,- Etiology of cancers Diagnosis of cancer, including tumour markers

## 6. CVS

- Definition of Ischaemia, Infarction, Aneurysm
- Rheumatic heart disease, Infective endocarditis, Atherosclerosis
- Myocardial infarction,Hypertension and pericardial effusion

## 7. Respiratory system

- Tuberculosis, Pleural effusion, Pneumonia, COPD and tumours

## 8. GIT

- Peptic ulcer, - Carcinoma of oesophagus, Stomach & Colon,
- Inflammatory bowel disease (UC & Crohns)

## 9. Liver and GB

- Hepatitis. Cirrhosis, Tumours of liver
- Cholecystitis and GB calculi

## 10. Renal

- Glomerulonephritis & Pyelonephritis
- Renal calculi-Nephrotic syndrome, Renal tumors, Polycystic renal dis-eases

## 11. Internal assessment **Exam**

## 12. MGS

- Cryptorchidism,Orchitis, epididymitis, Prostatic hyperplasia
- Carcinoma penis, Testicular tumors

## 13. FGS & Breast

- Ovarain tumours,- Fibroid- Carcinoma cervix- Carcinoma endometrium pap smear, Fibroadenoma breast, Carcinoma Breast-Predisposing factors& TNM

## 14. CNS

- Meningitis & encephalitis.- Alzheimer's disease, Tumours - Meningioma, Gliomas, Metastasis
- CSF collection, indication and contraindication, tests performed, cytocentri- fuge

## 15. Skin & soft tissue

Skin- SCC, Melanoma,BCC inflammatory lesions lipoma

## 16. Bone

Osteoporosis, Osteomyelitis,Rickets , Osteomalacia, Tumours – Osteosarcoma, Osteoclastoma , Ewings sarcoma & Arthritis

## 17. Endocrine

Organs, Pituitary, Adrenal brief; Thyroid – Goitre thyroiditis and tumours

Diabetes and its complications

**18. Anaemias** - Types of anaemia

**19. WBC disorders -** Non neoplastic and neoplastic

**20. Lymphoreticular system** - Lymphadenitis, Lymphomas

**21. Platelet and coagulation abnormalities-** Primary & Secondary He-mostasis

## 21 .Clinical Pathology I

Blood collection, anticoagulants used,vacuettes and their color code.complete hemogram and the various parameters ,Bone marrow – Indication of BM study & collection procedure, PT , APTT sample collection

## 22. Clinical Pathology II

Urine analysis –Physical, Chemical, microscopic,Dipstick parameters

## 23. Transfusion Medicine

Blood grouping, cross matching, Screening of do- nor, Precautions to take when you start blood transfusion, Monitoring during transfusion, Transfusion reactions, Blood components.

## Internal Assessment Exam

**Lab visit:**

**Histopathology lab**

**Hematology lab &blood bank**

**Cytology lab**

**Reference Books:**

**Basic Pathology:** An introduction to the mechanisms of disease

Sunil R Lakhani, Susan A Dilly,Caroline J Filayson

## Paper IV (AHS 14) – Section A: INTRODUCTION TO COMPUTER APPLICATION

**Course outcome:**

1. CO1: basic under-standing of use of computer.
2. CO2: Applications of computer in clinical departments.
3. CO3: Deatiled knowledge on how to use hospital information system.

**Coure Description:** This course is designed for students to develop basic under-standing of used of computer and its applications in Clinical Departments

| Unit | Time (hours) Th. | Pr. | Learning Objectives | Content | Teaching Learning activities | Assessment Methods |
|---|---|---|---|---|---|---|
| 1 | **10** | **5** | **Identify & define various concepts used in computer Identify applicationof computer** | Introduction<br>• Concepts of Computers<br>• Hardware and Software<br>• Trends and Technology<br>• Application of Computers | • Lecture cum discussion<br>• Explain using charts<br>• Panel discussion | • Short answer questions<br>• Objective Type |
| II | **5** | **10** | **Describe and use ofDisk Operating System (DOS) Demonstrate skillin the use of MS Office** | Introduction toDisk OperatingSystem<br>• DOS<br>• Windows (allversion)<br>• MS Word<br>• MS Excel with Pictorial Presentation<br>• MS - Access<br>• MS-Power Point | • Lecture<br>• Discussion<br>• Demonstration<br>• Practice session | • Short answers<br>• Objective Type<br>• Practical Exam and Viva voice |
| III | **10** | **5** | **Demonstrate skill in using multimedia**<br><br>**Identify features of computer aided teaching and testing** | • Multimedia :types & uses<br>• Computer aided teaching & testing | • Lecture<br>• Discussion<br>• Demonstration | • Short answers<br>• Objective Type<br>• Practical Exam and Viva voice |

| | | | | | | |
|---|---|---|---|---|---|---|
| IV | **10** | **5** | **Describe and use of the statistical packages** | • Statistical packages:<br>• Types and their features | • Lecture<br>• Discussion<br>• Demonstration<br>• Practice Session | • Short answers<br>• Objective Type<br>• Practical Exam and Viva voice |
| V | **5** | **5** | **Describe the use of Hospital Management System** | • Hospital Management System : Types and uses<br>• Electronic patient records | • Lecture<br>• Discussion<br>• Demonstration | • Short answers<br>• Objective Type<br>• Practical Exam and Viva voice |

## Paper IV – Section B: QUALITY ASSURANCE AND ACCREDITATION

**Course outcome:**

1. CO4: Introduction and basic concept of quality.
2. CO5: Standardization and Implementation

**Course Objectives:**

Modernization and its brand conscious make an organization thrive towards perfection in the comparative world of business. The underlying factor that al-lows an organization to stand the test of time is quality. The students are giv-en the working knowledge of the subject.

**Course Content:**

- Introduction to quality
- Definition, Concept, Benefits
- Function
- Design
- Formulation
- Standardization
- Implementation
- Factors affecting quality
- Need for quality
- Quality cycle
- Quality objectives
- Quality policy
- Quality measurable
- Quality Control, Quality Standards, Q C Tools
- Quality Documents, QC Records, Kazen techniques

- Such as Market-in, TOC, Q C Circles,
- Suggestion scheme, TPM, Kanban,
- JIT, Zero defect programme
- ISO
- Quality management system Quality manual
- Quality procedures
- Quality records
- Quality audit
- Correlative and preventive action
- SQC (Statistical Quality Control techniques)
- Cost effectiveness
- Cost of quality system
- Benefit in total cost
- Cost measuring system
- TQM- Concept, awareness, aspects train

**Detailed Course Plan**

**Unit- I**

Introduction to quality –Definition, concept, Benefits-Functions-Design- Formulation-Standardization

**Unit-II**

Implementation –Factors affecting quality –Need for Quality Cycle –Quality objec-tives- Quality policy

**Unit-III**

Quality measurable –Quality Control Quality Standards. Q C Tools –NABH, NABL, JCI~Quality Documents, QC Records. Kazen Technique such as Market-in, TQC .Q CCircles – Suggestion scheme. TPM, Kanban –JIT, Zero defect programmes

**Unit-IV**

ISO- Quality management system- Quality manual-Quality procedure- Quality records- Quality audit

**Unit- V**

Corrective and preventive action –SQC (Statistical Quality Control technique)Cost effectiveness-Cost of quality system- Benefit in total cost –Cost Measuring system- TOM- concept, awareness, aspects training

**Reference Text:**


1. Dale H Bester field. Carol Bester field, Glen H Bester field, MaryBester field –Scare, Total Quality Management .Wesley Logman (Singapore)Pte.Ltd. Indian Branch, 482F.I.E, Patparganj, Delhi 110092,India
2. K.Shridhara bhat, Total Quality management .Himalaya Publishing Hollse. "Ramdoot" Dr Bhalerao Mag. Girgaon, Mumbai-400004

## Paper V (AHS 15): ENGLISH

**Course Description:** The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for ef- fective communication in their professional work. Students will practice their skills inverbal and written.

**Course Outcome**

1. CO1: Develop their intellectual, personal and professional abilities.
2. CO2: Acquire basic language skills (listening, speaking, reading and writing) in order to communication with speakers of English language
3. CO3: Acquire the linguistic competence necessarily required in various lifesituations

| Unit | Time (Hours) | Learning Objective | Content | Teaching Learning activities | Assessment Methods |
|---|---|---|---|---|---|
| 1. | **10** | **Speak and write grammatically correct English** | • Review of grammer<br>• Remedialstudy of grammer<br>• Building vocabulary<br>• Phonetics<br>• Public speaking | • Demonstrate use of dictionary<br>• Class Room conversation<br>• Exercise on use of grammar<br>• Practice in public speaking | • Objectivetype<br>• Fill in the blanks<br>• Para Phrasing |
| II | **10** | **Develop ability to read, understand and ex- press meaning fully, the prescribedtext** | • Read and comprehend prescribed course books | Exercise on :<br>• Reading<br>• Summarizing<br>• Comprehension | • Short answers<br>• Essay Type |
| III | **8** | **Develop writing skills** | • Various forms of Composition<br>• Letter writing<br>• Note taking<br>• Precise writing<br>• Anecdotal re cords<br>• Diary writing<br>• Reports on health Problems+ etc.<br>• Resume / CV | Exercise on writing :<br>• Letter<br>• Note<br>• Precise<br>• Diary<br>• Anecdote<br>• Health problems<br>• Story writing<br>• Resume / CV<br>• Essay Writing<br>• Discussion on written reports / documents | • Assessment of the skills based on the check list |

| | | | | | |
|---|---|---|---|---|---|
| IV | **6** | **Develop skill in spoken English** | Spoken English<br>• Oral report<br>• Discussion<br>• Debate<br>• Telephone conversation | Exercise on :<br>• Debating<br>• Participating in Seminar, panel, Symposium<br>• Telephonic Conversation | • Assessment of the skills based on the check list |
| V | **2** | **Develop skill in listening com prehension** | • Listening Comprehension<br>• Media, audio, video, Speeches etc. | Exercise on :<br>• Listening to audio, video, tapes and identify the key points | * Assessment of the skills based on the check list |
| VI | **4** | **Develop skill in Grammer** | Grammer<br>• Transformation of Sentences<br>• Correction of sentence<br>• Vocabulary Building<br>• Composition<br>• Essay writing on topics of everyday life | Exercise on :<br>• Voice<br>• The Sentence<br>• Parts ofSpeech<br>• Direct and Indi rect Speech<br>• Affirmative and Negative<br>• Change the Question Tag<br>• Correction of Syllabus<br>• Idioms<br>• Letter writing – Personal, Official matters connection with daily life | • Assessment of the skills based on the check list |

# SECOND YEAR

Duration of Posting of trainees in different stations during training period

| Posting Station | Second Year | Third Year |
|---|---|---|
| Echocardiography | 5 months | - |
| ECG, Stress Testing, Holter | 5 months | - |
| Catheterization Lab | - | 10 months |

During the second year the students will be posted in the clinical area from 8 AM to 5 PM includes didactic lecture from 2 PM to 3 PM.

**Internal Assessment**

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks along with performance in the clinical posting.

## Paper VI: CARDIAC ANATOMY & CARDIAC PHYSIOLOGY

**Course outcome;**

1. CO1: Detailed knowledge in Cardiac Anatomy.
2. CO2: Detailed knowledge in cardiac physiology.
3. CO3: Detailed knowledge in conduction system of heart

**Cardiac Anatomy**

Anatomy of Heart:

- Surface anatomy,
- Gross anatomy, cardiac chambers, septa, valves,
- Pericardium

Arteries, Veins, Lymphatics

- Aorta and branches
- Venous drainage
- Pulmonary vessels and circulation
- Coronary circulation and coronary venous drainageConduction System of Heart

**Cardiac Physiology**

- Normal Cardiac Cycle
- Pulse
- Heart rate
- Blood pressure
- Cardiac output
- Heart Sounds, Murmurs
- Measurement of Blood Pressure: Technique : Sphygmomanometer
- ECG and Cardiac Cycle
- Physiology of Arrhythmias
- Chambers: Pressures, Wave Forms
- Arterial, Venous Pressures and Wave Forms
- Oxygen Saturations: Physiology of Oxygen Transport
- Blood Gases – Technique and Various parameters
- Various Gas laws
- Flow, pressure and resistance
- Physics of Cardiac Perfusion
- Cardiac Cycle, Circulation, Tissue Perfusion – Unified Concept

## Paper VII: CARDIOVASCULAR TECHNOLOGY – CLINICAL

**Course outcome:**

1. CO1: Basic knowledge in Radiation Physics and Application, Medical Elec-tronics.
2. CO2: Basic knowledge in ECG.
3. CO3: Basic knowledge in Exercise ECG.
4. CO4: Basic knowledge in echocardiography

**Radiation Physics and Application, Medical Electronics**

- Two dimensional X-ray technique
- Fluoroscopy
- Video Fluroscopy
- X-ray tube
- Absorption and scattering
- X-ray spectrum and extra filtering
- Image enhancement

- Flat panel technology
- Room shielding
- Personnel reduction
- Patient dose reduction
- Symptoms of Radiation Toxicity
- Registration and monitoring
- Biological risk ,Ergonomics
- Introduction to basic principles of medical electronics
- Calibration operation and clinical applications

**Electrocardiography**

- Basics and Principle
- Electrode / Lead Placements
- Normal ECG: Wave Form
- Normal ECG: Intervals
- ECG Machines: Functions, Frequency Response, Recording Speed, Sensitivity, Standardization, Stylus Lag (Heat Stylus)
- ECG and Chamber Hypertrophy
- ECG and Arrhythmia
- ECG in Myocardial Infraction, Myocardial Ischemia
- ECG in Miscellaneous Conditions: Metabolic, electrolyte changes
- ECG for Technician: Summary

**Exercise ECG**

- Equipments / Types of Exercise ECG
- Indication / Contradiction
- Lead Placement – Rationale, Limitation
- Monitoring during Ex. ECG: Clinical / ECG / Parameters
- Exercise ECG Protocol: Indications / Advantage and Disadvantage
- Exercise Physiology
- Exercise ECG: Preparation of Patient / Equipment / Defibrillators,Emergency Drugs
- Exercise ECG: Detection of Various Arrhythmais, Ischemia, andPlan of action
- Exercise ECG:

- Endpoints: Recognition and Action
- Post Exercise ECG: Observation, Instructions

**Echocardiography**

- Principle of Echocardiography
- Transducers
- Anatomical Planes for Viewing in Echocardiography
- Normal M-Mode Echo Study: Anatomy / Function:Measurements
- Normal 2D Echo Study: Anatomy / Function: Measurements.
- Echo for Cardiac Function- systolic and diastolic
- Echo in Heart Disease: Acquired
- Echo in Heart Disease: Congenital
- Contrast Echocardiography: Technique and Indications
- Transesophageal echocardiography
- 3D Echocardiography
- Echo Cardiography: Technician's Role:
    - Disposables
    - Archiving
    - Record Keeping
    - Stock-Indents, Stock Maintenance, Stock Verification

**Principle of Doppler**

Measurement of Flows and Gradients

- Assessment of gradients, shunts, valve areas, cardiac output
- Assessment of valve regurgitations

Utility of Doppler in Assessment of Cardiac Disease

- Tissue Doppler

Stress Echocardiography: Protocols, 2D Echo Views, AnalysisTrans -esophageal Echo

- Indication / Contraindication
- Patient Preparation
- Transducer: Maintenance, Sterilization, Handling etc.
- Monitoring
- Emergency Drugs
- Utility

Intra Vascular Ultrasound, Intracoronary Doppler wire

**Holter Recording**

- Principles of Holter
- Utility and indications
- Analysis of Holter

## THIRD YEAR

Duration of Posting of trainees in different stations during training period

| Posting Station | Second Year | Third Year |
|---|---|---|
| Echocardiography | 5 months | - |
| ECG, Stress Testing, Holter | 5 months | - |
| Catheterization Lab | - | 10 months |

During the third year the students will be posted in the clinical area (Cath lab) from 7 AM till the cases finishes in the cath lab including one hour hour didactic lecture.

**Internal Assessment**

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks along with performance in the clinical posting.

## Paper VIII: CARDIAC PATHOLOGY AND PHARMACOLOGY BCVT31

**Course outcome;**

1. CO1: Basic knowledge in cardiac pathology.
2. CO2: Basic knowledge in cardiac pharmacology.
3. CO3: Basic knowledge in cardiac monitoring

- Coronary artery disease and myocardial infarction
- Rheumatic Fever
- Valvular Heart Disease
    - Mitral stenosis
    - Mitral regurgitation
    - Aortic stenosis
    - Aortic regurgitation
    - Tricuspid valve disease
    - Combined valve diseases

    - Microbiology of Valvular Heart Disease
- Pericardial, Myocardial Diseases including End myocardial Diseases
- Hypertension
- Pulmonary Hypertension
- Congenital Heart Disease:
    - Acyanotic
    - Cyanotic
- Shunts
    - Left to Right Shunts
    - Right to Left Shunts
- Heart Failure
- Invasive Monitoring, CVP, Intra Arterial BP, PA Wedge Pressure, CardiacOutput

**Pharmacology**

- Modes / routes of Drug Administration (Rationale)
- Intra Venous Fluids: Crystalloids, Colloids
- Common Cardiac Drugs – PART-I: Digoxin, Diuretics, Vasodilators, Nitrates
- Common Cardiac Drugs – PART-II: Beta Blockers, Calcium Blockers, ACE in-hibitor
- Common Cardiac Drugs – PART-III: Antiarrhythmic drugs, Positive inotropicdrugs
- Drugs for Cardiac Resuscitation
- Drugs for all Cardiac and Medical Emergencies
- Contrast Media
- Adverse Reactions to Contrast Media
- Heparin, Protamine
- Identification of Anaphyaxis and Immediate Management
- Drug reactions, Drug interaction (Basics)

## Paper IX: CARDIOVASCULAR TECHNOLOGY – APPLIED BCVT32

**Course Outcome:**

1. CO1: Basics in Cardiac Catheterization lab.
2. CO2: Detailed knowledge in Equipments in Cath-Lab.
3. CO3: Detailed knowledge in Log Books, Registers in lab.
4. CO4: Detailed knowledge and technical expertise in various diagnostic and theraputic procedures in cathlab

**Cardiac Catheterization Part I**

- Cardiac Catheterization: Laboratory Setup / Types of Procedures
- Sterile Techniques in Cath Lab / Sterile Areas, Sterile Procedure, sterile trol-ley setting, Scrubbing, gowns and Gloves, scrubbing and draping Patients, handling sterile disposables etc.
- Sterilization and re-use of hardware
- Equipments: Cath-Lab Equipments
  - Defibrillator / Pacemaker / IABP / BOYLE's Apparatus / Suction Ma-chine/oxygen
  - Infusion Pumps / Programmed Stimulators, Pacing System Analyzers
- Equipments in Cath-Lab
  - Hemodynamic Recorders (Physiological Records)
  - Transducers
  - Recording of Pressure Wave Form:
- Range / Gain / Speed / Systolic / Diastolic And Mean Pressures In Chambers And Vessels
- Hazard Management
  - Radiation Protection
  - Infection Prevention
  - Injury Prevention: Electrical /Mechanical
- Wastes Management
  - Plastics
  - Biological Wastes
  - Glass / Needle / Syringes
  - Metallic Waste
- Technician's Role
  - Patient monitoring
  - Procedure Related : Data collection
  - Acquisition and entry of Data, Procedure Books,
  - Handling of Equipment
- Log Books, Registers etc.
  - Stock of all disposables Eg: Catheters etc.
  - Stores (Disposable Items)
  - Accounting (Used Items)
- Equipment Maintenance

- Cine Angiography: Cine Filming, Cine Film Processing and Cine Film Viewing , cine film library
- Contrast Media

**Cardiac Catheterization – Part-II**

- Cardiac Catheterization Procedure: Diagnostic Studies
- Cardiac Catheterization Procedure: Therapeutic / Interventional Procedures
- Acquisition of Cath Data : Cardiac Output / Oximetry and Shunts
- Acquisition of Cath Data: Pressures and Wave Forms; Recording Technique,Analysis
- Angiography: Technique / Views / Contrast Media
- Cardiac Catheterization
- Application of Echocardiography
- Hardware :Catheters / Connections / Sheaths / Stopcocks / Wires / Angiop- lasty Catheters
- Complication of Cardiac Catheterization: Recognition and management
- Cardiopulmonary Resuscitation
- Special Procedures:
  - Pericardial Tap
  - Atrial Septostomy
  - Endomyocardial Biopsy
  - Balloon Angioplasty (Valve)
  - Coronary Angioplasty
- Case Study of Simple Cardiac Disease
  - ASD, MS, Tetralogy of Fallot
- Hardware Of Cardiac Catheterization And Interventions
- Venous and Arterial Check Flow Sheaths, Manifolds, 3-Way Stock Cocks etc.
- Guide Wires and Dilators
- Puncture Needles (Vascular Access Needles)
- Woven Dacron Catheters: GL, NIH, Lehman, Woven Dacron Electrode Cathe-ters
- Flow Directed Catheters (Swan Ganz Type) Balloon Angio Catheters
- Polyurethane Catheters: Pig Tail, Judkins, Coronary, Amplatz Coronary, Brachial Coronary, Sones Catheters
- Guide Wires: Short, Normal Length, Exchange Length 'J' Tipped Movable Core, Tips, Deflectable Types
- Valvuloplasty Catheters, Atrial Septostomy Catheters
- Coronary Angioplasty: Guide Catheters, Guide Wire, Balloon Dilatation Cathe- ters, Indiflators, Y Connectors
  - Stents: Bare Stents, Mounted Stents, Other Types of Stents

## Paper X: CARDIOVASCULAR TECHNOLOGY – ADVANCED BCVT33

**Course outcome:**

1. CO1: Detailed knowledge in Pacing and Electrophysiology.
2. CO2: Basic knowledge in the management of complications in lab.
3. CO3: Recent advances in cardiovascular Technology

**Pacing and Electrophysiology**

- Arrhythmias: Brady and Tachy Arrhythmias
- Indication For Temporary / Permanent Pacing Technique: Temporary Pacing
- Permanent Pacing: VVI, AAI Pacing (Single Chamber Pacing)
- Permanent Pacing: DDD , other Modes of Pacing
- Septal defect Closure materials
- Pacemaker Clinic: Management of Pacemaker Patients, programmers
- Intracardiac Electrogram – Technique
- Intracardiac Electrogram – Analysis, Intervals etc.
- Electrophysiological Studies
- Radio Frequency Ablation for Arrhythmia's
- Implantable Cardioverter Defibrillator
- Cardiac Arrest
- Cardio Respirator Resuscitation
- Hypotension / Hypertensive Crisis
- Cardiac tamponade
- Cardiac Trauma
- Anaphylaxis
- Emergency Drugs
- Intra-aortic Balloon Pump
- Records Keeping: Indents, Stocks, Log Books, Procedure Books etc.
- Applications of ECMO(Extracorporeal Membraneous Oxygenation)

## SCHEME OF EXAMINATION

# B.Sc Cardiovascular Technology Degree Examination

**Distribution of Marks for each subject**

| Paper Code | Subject Name | Theory | | | | Paper Total | Aggregate |
|---|---|---|---|---|---|---|---|
| | | University | Internal | Oral | Subject Total | | |
| **FIRST YEAR** | | | | | | | |
| I | Section A - Anatomy | 50 | 10 | 15 | 75 | 150 | 1500 |
| | Section B - Physiology | 50 | 10 | 15 | 75 | | |
| II | Section A - Biochemistry | 50 | 10 | 15 | 75 | 150 | |
| | Section B - Pharmacology | 50 | 10 | 15 | 75 | | |
| III | Section A - Microbiology | 50 | 10 | 15 | 75 | 150 | |
| | Section B - Pathology | 50 | 10 | 15 | 75 | | |
| IV | Section A – Introduction to Computer Application | 50 | - | - | 50 | 100 | |
| | Section B - Quality Assur-ance and Accreditation | 50 | - | - | 50 | | |
| V | English | 50 | - | - | 50 | 50 | |
| **SECOND YEAR** | | | | | | | |
| VI | Cardiac Anatomy & Cardiac Physiology | 100 | 20 | 30 | 150 | 150 | |
| VII | Cardiovascular Technology - Clinical | 100 | 20 | 30 | 150 | 150 | |
| **THIRD YEAR** | | | | | | | |
| VIII | Cardiac Pathology & Cardiac Pharmacology | 100 | 20 | 30 | 150 | 150 | |
| IX | Cardiovascular Technology - Applied | 100 | 20 | 30 | 150 | 150 | |
| X | Cardiovascular Technology - Advanced | 100 | 20 | 30 | 150 | 150 | |
| XI | Practical +Viva (100+50) | - | - | - | - | 150 | |

## PATTERN OF QUESTION PAPERS

### 5. Paper I to Paper IV

The duration of each theory paper will be three hours; the paper will have two sec- tions (Section A & Section B) each carrying 50 marks and a total of 100 marks.

**Pattern of Question Paper**

| | |
|---|---|
| Structured Essay (2 out of 2) | - 20 marks (2 x 10 marks) |
| Short Notes (3 out of 4) | - 15 marks (3 x 5 marks) |
| Short answer question (5 out of 7) | - 15 marks (5 x 3 marks) |
| Total Marks | - 50 marks |

### 6. Paper V

The duration of Paper V will be two hours; the paper will have only one section for atotal of 50 marks.

**Pattern of Question Paper**

| | |
|---|---|
| English Grammar | - 20 marks |
| English Writing | - 30 marks |
| Total Marks | - 50 marks |

### 7. Paper VI to Paper X

The duration of each theory paper will be three hours; the paper will have only onesection of 100 marks.

**Pattern of Question Paper**

| | |
|---|---|
| Structured Essay (4 out of 4) | - 40 marks (4 x 10 marks) |
| Short Notes (6 out of 8) | - 30 marks (6 x 5 marks) |
| Short answer question (10 out of 12) | - 30 marks (10 x 3 marks) Total Marks - 100 marks |