SYLLABUS & COURSE FRAME WORK
BACHELOR OF VOCATIONAL DEGREE
in
CARDIAC LABARATORY TECHNOLOGY

WITH EFFECT FROM ACADEMIC YEAR 2019-20
REGULATION AND CURRICULUM FOR THE
BACHELOR OF VOCATIONAL DEGREE COURSE IN
CARDIAC LAB TECHNOLOGY
(REVISED FROM 2019-20)

1. **Title of the course**: B.VOC (CARDIAC LAB TECHNOLOGY)

2. **Eligibility for admission**: A candidate seeking admission to the Bachelor of Vocational Degree Courses in Para medical sciences shall have passed higher secondary examination (10, +2) or equivalent with physics, chemistry and biology as principal subjects of study.

   Or

   Vocational higher secondary examination with Physics, Chemistry and Biology in addition to vocational subjects.

3. **Sanctioned student strength**: 20 Students.

4. **Course significance**: Cardiac technicians also referred as Cardiac Vascular Technicians/Cardiac Care Technicians prepare patients for cardiac procedures including electro cardiogram, Stress tests etc. In addition they need to operate complicated cardiac equipment such as cardiac output monitoring units and defibrillators. Also they have to ensure that equipment’s are ready to use and the cardiologists are familiar with a patient's medical history. Plenty of career opportunities are available for trained cardiac technicians in the government and private sectors including hospitals, medical clinics, cardiologist’s office and other health care environments.

5. **Course objectives**: The B.Voc. course on cardiac lab technology aims to develop:

   (i). **Key skills**: cardiac technicians must be very detail oriented and have strong inter personal skills to work with patients.

   (ii). **Computer skills**: ability to use computer for procuring medical data, record maintenance and inventory management.

   (iii). **Technical skills**: cardiac technicians need to operate all cardiac equipment, need to do the upkeep and maintenance of equipment, preparing patients for the procedures, briefing the cardiologist on the medical history of the patient etc.
6. Course description:
The cardiac lab technology program is structured to prepare the students to perform the duties and responsibilities of a cardiac technician. The curriculum includes two major components such as **general education and vocational education**, apart from English communication and computer skills. The vocational content has given more weightage by having more hours of teaching in theory as well as practical and also by incorporating **vocational skill training** in a clinical setting under the supervision of cardiologist, expert technicians, (skill knowledge providers) as an integral component of the curriculum. This will enable the students to gain both didactic knowledge and practical experience in cardiovascular science ECG, holter monitoring, echocardiography etc.

7. Duration of the course:
The duration of the course shall be three years with semester pattern.

8. Medium of instruction:
The medium of instruction and examination shall be in English.

9. Course implementation:
(i). General education component of the curriculum would be imparted in Pondicherry University Community College and skill training by SKP (Skill Knowledge Providers) such as physicians, trainers, senior technicians, etc. of the hospital sectors.
(ii). A log book would be maintained for students with SKP’s and continuous assessment and end semester evaluation of skill would be done by SKP.
(iii). Only the necessary number of core faculties would be there in the institution and the remaining would be drawn as guest faculties from skill sectors and people with experience and expertise in the specific vocational skills.
(iv). The expenses in connection with job training (training fees) educational tour, field visits etc. if any should be borne by the candidates.

10. Attendance:
Every candidate should have attended at least 80% (compulsory) of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by university, in each of the subjects prescribed for that year separately, in theory and practical. Only such candidates are eligible to appear for the university examinations.
11. **Schedule of Examination:**

The university shall conduct examinations semester wise as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination.

12. **Conducting Examination:**

(i) Theory Exams: Pondicherry University for general and Vocational papers

- English and computer exams: Pondicherry University
- All other papers (general as well as vocational) periodic assessment and end semester exams: are conducted by Skill Knowledge Providers (SKP) or trainers in the clinical settings and marks shall be submitted in sealed covers (in duplicates) to Community College. This will be forwarded to Pondicherry University from Community College.
Also a certificate from the SKP / HOD / Institution shall be issued to each student at the end of each semester on the clinical training imparted in the respective institutions, giving the assessment of Skill performance of the candidate as grade(marks).

Note: Remuneration as per University norms shall be given to SKP for conducting practical exam for Vocational & general education paper.

13. Declaration of Class:
   a. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 75% of marks or more of grand total marks prescribed will be declared to have passed the examination with Distinction.
   b. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 65% of marks or more but less than 75% of grand total marks prescribed will be declared to have passed the examination in the First Class.
   c. A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt and secures 50% of marks or more but less than 65% of grand total marks prescribed will be declared to have passed the examination in the Second Class.
   d. A candidate passing the university examination in more than one attempt shall be placed in Pass category irrespective of the percentage of marks secured by him/her in the examination.

[Please note faction of marks should not be rounded off clauses (a),(b) and c)].
### 14. Course structure and scheme of Examinations:

#### BACHELOR OF VOCATIONAL DEGREE IN CARDIAC LABORATORY TECHNOLOGY

<table>
<thead>
<tr>
<th></th>
<th>General Papers</th>
<th>Hours</th>
<th>Vocational papers</th>
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# EXAMINATION SCHEME OF B.VOC DEGREE IN CARDIAC LABORATORY TECHNOLOGY

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Vocational paper's practical will be evaluated by the skill provider * PC – Practical, PR- Practical Report, VV – Viva-Voce
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<td>330 marks</td>
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# SYLLABUS CONTENTS

## CARDIAC LABORATORY TECHNOLOGY

*(Bachelor of Vocational Degree Course)*

<table>
<thead>
<tr>
<th>I-Semester</th>
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<td>Computer &amp; IT Skills</td>
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<td>General Paper – III</td>
<td>Anatomy &amp; Physiology</td>
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<td>General Paper –IV</td>
<td>Biochemistry of the Heart</td>
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<td>Principle of Electrocardiography</td>
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<td>Recent Advances in Cardiac Imaging</td>
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<td>Internship-II</td>
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SYLLABUS

I YEAR – 1ST SEMESTER

GENERAL PAPER I: ENGLISH

Foundation course — ENGLISH

Objective and Learning Outcome: To strengthen the student’s academic English writing and reading skill; To strengthen skills in oral communication and be able to address different kinds of audiences.

Unit 1
Fundamentals of Language: Grammar and Vocabulary: Articles, prepositions, modal auxiliaries, Limited to the basic use of Parts of Speech.

Unit 2

Unit 3
Creative writing: Basic writing skills, developing ideas and themes, writing introduction, welcoming, thanks giving, reporting events and conclusion. Describing everyday events, recounting incidents, letter writing.

Unit 4
Effective Oral Communication [Spoken English]: 1) Introducing yourself 2) Presentation 3) Group Discussion 4) role play

Unit 5
Developing Conversational Ability:
1) Meeting People, Exchanging Greetings and Taking Leave 2) facing interview3) Introducing People to Others 4) Answering the Telephone and Asking for Someone 5) Dealing with a Wrong Number 6) Taking and Leaving Messages 7) Making Inquiries on the Phone 8) Calling for Help in an Emergency 9)Participating in small talks- At the office, At the railway station, At the airport, At the travel agency, At the bank, At the doctor’s clinic, At the hospital.

Text Books:
GENERAL PAPER II: IT & EQUIPMENT’S

Theory: 30hrs
Practical: 20hrs

Objective and Learning Outcome: To introduce the students to the basics and practical knowledge of computer programming and MS-Office tools; To familiarize the students with the basics and practical knowledge of handling equipment’s related to cardiac lab.

UNIT-I
Introduction to Computer - Function and components of a computer, Types & characteristics of computers, Input and Output devices, Auxiliary storage devices.

UNIT-II

UNIT-III

Introduction to Power Point; Usage of Design Templates - Presentation Using Wizards - Slide Transition & Animations - Inserting Clip Arts & Pictures - Background & Colour Layouts

UNIT-IV
ECG machine, 2D Echo machine, Stress test system, Cardiac monitors, Infusion pumps, Balloon pumps, Defibrillators, Automated external defibrillators (AED), Diagnostics.

UNIT-V
Cardiac ultrasound machine, vascular ultrasound machine, EKG machines, Heart-lung bypass machine, Vascular Doppler, Cardiac Cath Lab equipment – closure/compression device/ sheath/ stent/wire.

Practical’s:
1. Various browsers, Search engines, email
2. Text document with images with multiple formatting options using a specified office package
3. Spread sheet using a specified office package
4. Presentation on a specified topic using the specified locations

Reference Books:
Latest editions of the following books:
1. An introduction to GCC by Brain J.Gough, foreword by Richard M.Stallman
2. Microsoft office 2003 by Jennifer Ackerman Kettell, Guy Hart-Davis
Objective and Learning Outcome: To describe the location and position of the heart within the body cavity. To describe the internal and external anatomy of the heart. To identify the tissue layers of the heart and to relate the structure of the heart to its function as a pump.

Anatomy
1. Background
2. Anatomical Positions and Orientation of the Heart within the Thorax.
3. Pericardium
4. Cardiac Skeleton.
5. Tricuspid Valve
6. Mitral Valve
7. Aortic Valve
8. Pulmonary Valve
9. Cardiac Grooves, Crux, Margins.
10. Right Ventricle
11. Left Ventricle
12. Ventricular Septum
13. Atrial Septum
15. Left Atrium
17. Regional Coronary Artery Supply.
18. Coronary Collaterals.
19. Great Vessels
20. Cardiac Conduction System.

Physiology
1. Properties of cardiac tissue, including electrophysiology
2. Hemodynamics
4. Excitation-Contraction Coupling
5. Fundamentals of Myocardial Contractility.
6. The Electrocardiogram and Electrocardiology.
7. The Cardiac Cycle.
8. Left Ventricular Function.

Practical’s:
1. Identification of structures, chambers, valves of the heart and their function
2. Identification of blood cells and their function
3. Identification of blood vessels and their function
4. Blood Pressure measurement
5. Estimation of hemoglobin

**Reference Books:**
Latest editions of the following books:
1. Ross and Wilson: Anatomy and Physiology in health and illness by Waugh Grant; Churchill Livingston - Elsevier

**GENERALPAPER- IV**

**BIOCHEMISTRY OF THE HEART**

**Objective and Learning Outcome:** Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways with respect to heart

1. Myocardial Metabolism.
2. Lipids and the Heart.
3. Biochemical Estimations in Cardiology.
4. Biomarkers
5. Kidney and the Heart.
6. Acid-Base Balance.
7. Cardiac Enzymes.
8. Cholesterol Metabolism.
9. Fatty Acid Metabolism.
10. Rare Biochemical Associations of the Heart.

**Practical’s:**

1. Estimation of cholesterol
2. Lipid Profile
3. Estimation of Triglyceride
4. Troponin test
5. Creatine Kinase (CK-MB)test
6. LDH test

**Text Books:**
Latest editions of the following books:

3. Textbook of medical biochemistry- Chatterjee & Shinde :Jaypee.
4. Practical Clinical Biochemistry- Varley : CBS publication
VOCATIONAL PAPER-I:
PRINCIPLES OF ELECTROCARDIOGRAPHY AND HOLTER

**Objective and Learning Outcome**: To enable the students to understand the operation, evaluate and interpret ECG patterns. To familiarize the students with Holter monitor system and reporting

1. Introduction to ECG, ECG Apparatus, Bipolar Standard Leads, Bipolar Chest Leads, Unipolar Leads, Unipolar extremity Leads, Unipolar Precordial Leads, Monitor Leads, and Relation between Unipolar Extremity Leads & Standard Bipolar Leads.

2. Electrophysiology of the Heart: Intracellular Potentials, Electrical Potentials produced by normal cardiac muscle

3. Cardiac Electrical Activity: Anatomic Orientation of the Heart, The Cardiac cycle, Cardiac impulse formation and conduction, Recording Long and Short axis of cardiac electrical activity.

4. Recording the Electrocardiogram: Evolution of Frontal Plane Leads; Transverse plane Leads; Correct and incorrect leads placement; Display of the 12 standard ECG.

5. Interpretation of the Normal ECG: ECG features, Rate and Regularity, P-Wave morphology, PR interval, QRS morphology, ST-segment, T-wave & U wave morphology, QTC interval, Cardiac rhythm, ECG in Infants & Children, Normal Variants of the Adult ECG, Dextrocardia & Dextroversion, Technical Dextrocardia.


7. Intra ventricular Conduction abnormalities: Normal conduction, Bundle Branch and Fascicular blocks, Systematic approach to the Analysis of BB and Fascicular blocks.

8. Introduction to Holter Recordings. Principles and Techniques, Indications, Equipment, Data Retrieval and Storage. Reporting
Practical’s:
1. Types of ECG Equipment’s: Proper handling and maintenance of Equipment’s
2. Patient information and patient privacy
3. Connecting ECG electrodes, ECG recording, standardization, writing correct name and ID of the patient.
4. Performing bedside ECG
5. Maintenance of Equipment’s and maintenance of their cords
6. Troubleshooting
7. Proper communication with the patients
8. Holter Recording-Practical Aspects, Equipment and Connections, Recording and Storage

TEXT BOOKS RECOMMENDED:
Latest editions of the following books:
1. Electrocardiogram- LEOSHAMROTH
2. Principles of Electrocardiogram-MARRIOTGOLDMAN
Objective and Learning Outcome: To provide the student with a systematic approach to the evaluation of patients with heart disease. To understand and classify common cardiovascular conditions and diagnostic tests.

1. Atherosclerosis, Heart attack, Ischemic stroke, Hemorrhagic stroke, Heart failure, Arrhythmia, Heart value diseases.
2. Myocardial Ischemia: Introduction, ECG changes during myocardial ischemia, injury and infarction, Ischemia and Injury due to increased myocardial demand, Ischemia and Injury due to insufficient Blood supply.
4. Miscellaneous conditions: Cardiomyopathies, Pericardial Abnormalities, Pulmonary Abnormalities Intracranial Hemorrhage, Endocrine and Metabolic Abnormalities, Electrolyte Abnormalities, drug effects.
5. Abnormal Rhythms: Introduction to Arrhythmias, Approach to arrhythmia diagnosis, problems of Automaticity, impulse conduction (block & re-entry)
7. Coronary artery disease; Acute myocardial infarction; segmental hypo kinesia;
8. Inferior infarct, anterior infarct, apical infarct, chronic ischemic heart disease, LVT hrombi.
9. CONGENITAL HEART DISEASE:-Diagnostic approach:
   Variation in cardiac position and situs: situssolitus with evocardia, situssolitus with, situsinversus with dextrocardia, situsinversus with levocardia
GENERAL PAPER-VI
MICROBIOLOGY

Theory: 50hrs
Practical: 20hrs

Objective and Learning Outcome: To explain the theoretical basis of the tools, technologies and methods common to microbiology and demonstrate practical skills in the use of tools, technologies and methods common to microbiology.

Microbiology

1. Introduction to microbes and study of Microscope
2. Sterilization and Disinfection
3. Identification of Bacteria
4. Common Culture media in Laboratories
5. Staphylococci
6. Streptococci
7. Pneumococci
8. Neisseria
9. Mycobacterium Tuberculosis
10. Gram Positive and Gram Negative Organisms
11. Pasteuralla, Yersinia and Brucella
12. Bacteriological Examinations of Body Fluid

Practical’s: Microbiology

1. Methods of Sterilization
2. Collection of specimens for bacteriological examination
3. Handling and preparation of the specimens for microscopic examination
4. Common bacteriological staining techniques
5. Composition and preparation of common types of culture media.
6. Examination of specimens such as pus, body fluids, urine, stool, sputum, throat swab etc.
Objective and Learning Outcome: To provide the students with basic and practical knowledge with reference to advance ECG and exercise physiology.

1. Cardiovascular and pulmonary responses to exercise. Type of Exercise, Exercise Physiology Maximum Oxygen Uptake, Myocardial Oxygen uptake, Heart rate Response, Arterial Blood pressure response etc.
2. Relative & absolute Indication, contraindication, Termination of Exercise, Testing Procedures: Subject preparation, Electrocardiographic Recording, Equipment and protocols, test supervision and interpretation, post exercise period
3. Fourlevelanginascaleforexercisetolerancetest, Metabolic equivalent, etc
4. Complication secondary to exercise tests.
5. Interpretation; clinical response:- symptoms, subject appearance, physical examination, exercise capacity
6. Haemo dynamic response; blood pressure, HR during exercise, Brog scale for rating perceived exertion.
8. Diagnostic value of the exercise test, prognostic use of the exercise test, exertional hypotension. Cardiac events in-patient with silent ischemia. Exercise parameters associated with poor prognosis and/or increased severity of CAD. Other uses of exercise test.
9. Drugs and exercise testing; Beta blockers, vasodilators, ACE-Inhibitors, calcium antagonists, digitalis, other drugs
10. Special cases of exercise testing interpretation.

LIST OF PRACTICAL EXERCISES:
1. Types of TMT equipment’s: Proper handling and maintenance of equipment’s
2. Getting familiarize with different TM protocols
3. Patient information and patient privacy
4. Performing TMT
5. Interpretation of ECG changes during exercise and recovery
6. Reporting and Data Storage
TEXT BOOKS RECOMMENDED:
Latest editions of the following books:
1. Elle stedt’s Principles of Exercise Electrocardiogram.

TEACHING LEARNING ACTIVITIES
The course content will be covered by:
1. Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Clinical lab postings
6. Seminars
7. Assignments.
Objective and Learning Outcome: To equip the students with an understanding of the various service departments and their functions; To provide them with the handling of patients and infection control practices.

- Hospital Departmental Classification
- Non Clinical Departments
- Central Sterile and Supply departments
- Medical Records
- Pharmacy
- Front Office & Billing
- Laundry and Linen Services
- House Keeping Services
- Kitchen Services
- Biomedical and Engineering Services
- Clinical departments
- OPD, IPD, ICU, Emergency,
- Visit to hospital departments
- Diagnostics (cardiology Lab)
- INITIAL APPROACH TO THE PATIENT:
  Atrial situs and viscera atrial relation; Abdominal situs- visceroatrial discordance; Atrio ventricular connections; Ventricular number, size, orientation and identity.
  Great vessel orientation and identity; Ventricle and great vessel relationship Presence and location of intra cardiac shunt; Location and presence of outflow obstruction.

- Introduction to Hospital Routine Procedures:
  Admissions; Discharge; Patient Complaints; Availability of Materials; Methods of Infection Control (sterilization, disinfection, spill management, etc).
Objective and Learning Outcome: To provide the students with a thorough knowledge of the basic and routine patient care techniques; To enable them to service to the basic care procedures.

1. Patient Rights, Customer etiquette, telephone handling
2. Introduction to Sick Nursing
3. Sponging of Patients
4. Medical Terminology
5. Basic Infection Control practices
6. Cleanliness and disinfection of ward and appliances
7. Bed Making
8. Sample and medicine transport
9. Reception of Patients, appointments
10. Medical and Nursing Ethics
11. Care of Skin
12. Care of Bed sores and their prevention
13. Attendance to Patients various needs
14. Care of Mouth
15. Care of Nails
16. Care of Bladder and Bowel
17. Shifting and transportation of Patients
18. Patient safety
19. First Aid Certificate Course Basic
20. First Aid Techniques
BIOMEDICAL & e-WASTE MANAGEMENT – III SEMESTER
GENERAL PAPER – VII

Theory: 40 hrs
Practical: 20 hrs

Objective and Learning Outcome: To understand, classify and dispose biomedical waste; To learn the regulations governing waste management and best practices.

Biomedical waste

1. Introduction
2. General Considerations
3. Separate waste streams
   3.1. Sharp wastes
   3.2. Infectious non sharp wastes
   3.3. General waste
   3.4. Recyclable items
   3.5. Pharmaceuticals
4. Colour coding
5. BMW Management Committee
   5.1. Structure Composition
   5.2. Functions
6. Steps
   6.1. Segregation
   6.2. Collection
   6.3. Transportation
   6.4. Disposal
7. Documentation
   7.1. Application for authorization

References:
GENERAL PAPER VIII
PHARMACOLOGY IN CARDIOLOGY

Objective and Learning Outcome: To utilize critical thinking skills in discussing the concept of pharmacotherapy. To understand basic concepts of pharmacology in cardiology.

1. Angiotensin, Aldosterone and Renin Inhibition.
2. Positive Inotropic Drugs.
3. Antihypertensive Drugs.
4. Diuretics.
5. Drugs for Dyslipidemias.
6. Drugs for Diabetes and Cardio dysmetabolic Syndrome.
7. Drugs for Acute Coronary Syndromes.
8. Drugs for Dysrhythmias.
9. Drugs for Heart Failure.
10. Drugs for Stable Angina.
11. Drugs for Pulmonary Hypertension
12. Cardiac Drugs in Pregnancy.

Practical’s:
1. Labelling of drugs
2. Calculation of drug doses and dilutions
3. Pharmacy preparation
4. Route of administration of drugs
5. Short experiments for efficacy and safety

Text Books:
Latest editions of the following books:
1. Essentials of Pharmaco therapeutics–Barar ; S.Chand &Co.
2. Essentials of medical Pharmacology by Tripathi:Jaypee
3. Practical manual of Pharmacology by BadyalDinesh:Jaypee
VOCATIONAL PAPER V:  
ECHOCARDIOGRAPHY BASIC TECHNIQUES

Objective and Learning Outcome: The student will be exposed to and become familiar with the technical performance, interpretation, strengths, and limitations of 2-dimensional echocardiography and Doppler. To enable the students to correlate Echo and Doppler exam with other exam results

1. Physical principles, instrumentation, and routine examination Properties of ultrasound, the transducer, Echocardiography

2. Basic Principles of Echocardiography-equipment’s and Instrumentation

3. Indications for Echo

4. Trans Thoracic Echo cardiographic examination

5. Standard plane position-standard imaging planes;
   - Parasternal long axis, parasternal short axis, apical views, Subcostal views suprasternal views

6. M mode echocardiography

7. Principles of Doppler flow images
   - The Doppler Effect, frequency description and analysis, Application of sampling theory to Doppler signal analysis, Limitation in the direct application of the Doppler equation to clinical velocity & Bernoulli’s equation for velocities

8. Doppler instrumentation
   - Doppler pulse transmission, summary of factors affecting Doppler sensitivity

9. Principles of flow:
   - Structure of blood and its relation to ultrasonic scattering, blood flow, hydraulic energies, pulsatile flow, vessel diameter, velocity profile

10. Principles of colour flow imaging:
    - The colour flow mapper, interrelationship of velocity resolution, depth of field, line density and frame rate
    - Colour Doppler spatial, temporal and velocity resolution

11. Trans esophageal Echo-Indications, Contraindication, Indications, Equipment and Transducers, Patient Preparation, Image Recording, Views and Interpretation.
Objective and Learning Outcome: To enable understanding of cardiac emergencies and CPR techniques

1) Cardiac Arrhythmias
2) Cardiovascular (Cardiogenic) Shock
   a) etiology
   b) practical exposure to patients

3) SUDDEN CARDIAC DEATH
   a) Definition of sudden cardiac death
   b) Causes of SCD
   c) Mechanisms underlying SCD
   d) Predictors of SCD
   e) Identification of high-risk patient
   f) Pathological correlates of SCD
   g) Prodromal symptoms
   h) Cardio-vascular manifestations prior to SCD
   i) Prevention of SCD

4) CARDIAC ARREST
   a) Definition
   b) Common causes
   c) Diagnosis and identification
   d) Prevention
   e) Prompt action(CPR)

5) First Aid in cardiac emergencies

6) Cardio – Pulmonary Resuscitation (CPR) and Basic Cardiac Life Support (BCLS)
   a) Practical training in management of cardiac arrest
   b) Role of resuscitation (CPR) in SCD and cardiac arrest
   c) “ABC” of cardio – pulmonary resuscitation
   d) Definition of cardiac life support (BCLS)
   e) BCLS training for cardiac technicians and Para-medical professionals

I. Maintenance of clear AIRWAY (A) during CPR in BCLS
   Heimlich procedure - swabbing out throats creations
   During CPR in ACLS – use of suction devices – use of pharyngeal airway
   – endo-tracheal intubation – adjuncts for airway control.

II. Circulatory support during CPR

I. in BCLS – external chest compression – procedure with practical demonstration


Outcome of resuscitation – prognosis related to time of initiating CPR – of Brain death – termination of CPR attempts – post arrest care – after care following Successful CPR.
Objective and Learning Outcome: To familiarize the students with principles and procedures in ICCU; To provide a practical knowledge in handling ICCU patients and equipment’s.

1. Introduction to Cardiac Intensive Care- Principles, Common Disorders
2. Approach to a patient with Cardiac Emergency, Commonly Used Cardiac drugs, dosage and side effects
3. Management of Common cardiac Emergencies-Acute Myocardial Infarction, Acute Left ventricular failure, Pulmonary edema, Pulse less Ventricular tachycardia, Ventricular fibrillation, cardiac Tamponade
4. Principles and Techniques of Bedside Cardiac Procedures-Trans venous Pacing, Central Venous lines, Pericardio cent sis, IABP
5. Cardiopulmonary Resuscitation:-
   Advanced Cardiac Life Support- Principles and Techniques
II YEAR - IV SEMESTER

Theory: 50hrs
Practical: 20hrs

GENERAL PAPER - IX

ADVANCED ECHOCARDIOGRAPHIC TECHNIQUES

Objective and Learning Outcome: To learn the functions and operations of advanced echo cardiograph; To interpret the reports.

1. Left ventricular inflow tract:
   Mitral valve: normal valve, anatomy, normal leaflet motion-
   Abnormal mitral valve Echo: Rheumatic mitral stenosis; severity estimation,
   Mitral insufficiency:- diagnosis, severity assessment
   Mitral valve prolapse - Flail mitral leaflet
   Mitral valve vegetation

2. Left Atrium: Left atrial function, dimension atrial dilatation and compression, LA tumours, LA thrombus.

3. Left ventricular out flow tract:
   Aortic valve; normal anatomy, trans valvar flow patterns
   Abnormal aortic valve echo, congenital aortic valve abnormalities, bicuspid aortic valve
   Aortic leaflet thickening without stenosis
   Valvular aortic stenosis, severity estimation of AS,
   Aortic Insufficiency:-Ascending aorta, arch, Co-arctation of Aorta, Aortic aneurysms,
   The sub valvular LV-Outflow tract:-subaortic stenosis,

4. Left ventricle;- 
   Examining planes, parasternal long axis, SAX, Apical view, subcostal view, LV volume-Simpson method, normal and abnormal values, LV mass, LVH, stroke volume EF, FS, valvular disease and LV,LV in hypertension, Hypokinesia, akinesia, dyskinesia, pseudo/true aneurysm.

5. Left ventricle; Coronary artery disease;
   Acute myocardial infarction; segmental hypokinesia; Inferior infarct, anterior infarct, apical infarct, chronic ischemic heart disease, LV Thrombi.

6. Stress Echocardiography;
   Assessment of global ventricular function, types of response, bulls eye method of analysis, complications of pharmacological stress- Echo

7. Echocardiographic assessment of cardiomyopathies:-
   Hypertrophic cardiomyopathy, Dilated Cardiomyopathy, Restrictive Cardiomyopathy
GENERAL PAPER -X

CARDIAC CATHETERIZATION LABORATORY BASICS & TECHNIQUES

Objective and Learning Outcome:
To learn cardiac catheterization procedures and techniques. To interpret reports and learn the interventions.

1. Cardiovascular laboratory technology during cardiac interventions.
2. Techniques and Principles in Hardware Choices I Coronary Interventions
3. Balloon Preparation and sizing for Valvuloplasty
4. Quantitative Coronary Angiography for guiding angioplasty and Stenting
5. Angiographic measurement of defect sizes
6. Connection of Angiographic contrast injectors and performance of cavity angiography
7. Process the cine films
8. Identification of intra cardiac signals
9. Setting up of Intra cardiac multichannel recordings for Electrophysiology studies
10. To assist in detecting abnormal intra cardiac signals
11. Emergency care of Cardiac patients
12. Cardiac Resuscitation
13. Proper concentration on sterility
14. Maintaining a proper hospital record of the procedures

LIST OF PRACTICAL EXERCISES:
1. Cardiovascular laboratory technology during cardiac interventions.
2. Techniques and Principles in Hardware Choices I Coronary Interventions
3. Balloon Preparation and sizing for Valvuloplasty
4. Quantitative Coronary Angiography for guiding angioplasty and tenting
5. Angiographic measurement of defect sizes
6. Connection of Angiographic contrast injectors and performance of cavity angiography
7. Process the cine films
8. Identification of intra cardiac signals
9. Setting up of Intra cardiac multichannel recordings for Electrophysiology studies
10. To assist in detecting abnormal intra cardiac signals
11. Emergency care of Cardiac patients
12. Cardiac Resuscitation
13. Proper concentration on sterility
14. Maintaining a proper hospital record of the procedures

TEACHING LEARNING ACTIVITIES:
1. Clinical lab postings
2. Group Discussions
3. Practical
4. Demonstrations
5. Seminars
6. Assignments.
Objective and Learning Outcome: To equip with the basic and advanced equipment's in cardiac catheterization lab.

1. Introduction to Cardiac catheterization laboratory


4. Theory of Cardiac catheterization: Protocol, Contraindications, Complications, Cardiac catheterization entry sites- arterial access, radial access, cut down, Heart procedures: Left Heart procedure, Right heart procedure, combined heart procedure.


6. Theory of Cardiac catheterization: Protocol, Contraindications, Complications, Cardiac catheterization entry sites- arterial access, radial access, cut down, Heart procedures: Left Heart procedure, Right heart procedure, combined heart procedure.
Objective and Learning Outcome: To learn the operation and use of pacemakers.

1. Basic concepts of the pacemakers
2. Pacemakers modes
3. Temporary pacemakers
4. Permanent Pacemakers
5. Single chamber and dual chamber pacemakers
6. Biventricular Pacemakers
7. Indication of Pacing
8. Coding of Pacemakers
9. Pacemaker parameters
10. Pacemaker programming
11. Pacemaker testing and surveillance
12. Defibrillators

TEXT BOOK RECOMMENDED:

2. Textbook of Cardiac Catheterization-Morton JKern
3. Angiocardiography-Freedom

TEACHING LEARNING ACTIVITIES:

1. Clinical lab postings
2. Group Discussions
3. Practical
4. Demonstrations
5. Seminars
6. Assignments.
Objective and Learning Outcome: To sensitize the students with the need for environment management systems. To make them appreciate environment protection methods.

Unit 1: The Multidisciplinary Nature of Environmental Studies
Unit 2: Natural Resources
Unit 3: Ecosystems
Unit 4: Biodiversity
Unit 5: Pollution
Unit 6: Social Issues and the Environment
Unit 7: Human Population and the Environment
Unit 8: Case Studies

Textbook:
Text book of Environmental Studies for Undergraduate Courses of all Branches of Higher Education

Erach Bharucha
For University Grants Commission
Objective and Learning Outcome: To understand the procedure of Interventional cardiology and electrophysiology.

1. Angioplasty: Percutaneous Coronary Angioplasty, Maintaining Perfusion with Angioplasty, Cutting Balloon angioplasty catheter, Stents-various types

2. Valvuloplasty- Mitral, Pulmonary, Aortic- Principles and Indications, Techniques, Hardware requirement, Procedural Complications.


Vocational Paper - XI
INTERNSHIP I
Practical-400hrs
III YEAR - 6th SEMESTER

VOCATIONAL PAPER XII: RECENT ADVANCES IN CARDIAC IMAGING

Theory: 40hrs
Practical: 60hrs

Objective and Learning Outcome: To familiarize the students with the recent trends and emerging techniques.

1. Principles of CT and MRI.
2. Indication, Contraindications for Cardiac CT and MRI
3. Protocols, Precautions, Techniques and Equipment for Cardiac CT & MRI
4. Principles of Radio nuclear scanning and Radiation safety
5. Radioactive isotopes and cardiac application
6. Myocardial Viability Scan, Stress Perfusion and Acute Infarction Scintigraphy
7. Radio nuclear Myocardial scanning, Instruments and Techniques and Protocols
8. Cardiac CT including CT angio.
9. MRI including CMRI.
10. Nuclear Scan
Vocational Paper-XIII
INTERNERSHIP II
Practical-460 hrs