# Diploma in Cardiac Non Invasive Technology

## REGULATIONS

### 1. ELIGIBILITY FOR ADMISSION

i) Candidates belonging to all categories for admission to the **Diploma In Cardiac Non Invasive technology** should have passed the minimum education qualification is 12$^{th}$ science group or equivalent schooling from recognized or University.

### 2. AGE LIMIT FOR ADMISSION:

A candidate should have completed the age of 17 years at the time of admission or would complete the said age on or before 31st December of the year of admission to the **Diploma In Cardiac Non Invasive Technology**

### 3. ELIGIBILITY CERTIFICATE:

The candidate who has passed 12$^{th}$ qualifying examinations other than HSS Examination conducted by the Government of Tamil Nadu, before seeking admission to any one of the affiliated institutions shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with application form, which shall be downloaded from the University website (www.tnmmu.ac.in)

### 4. REGISTRATION:

A Candidate admitted in any one of the **Diploma In Cardiac Non Invasive Technology** in any one of the affiliated institutions of this University shall register his / her name with this university by submitting the prescribed application form for registration duly filled, along with the prescribed fee and a declaration in the format to the Academic Officer of this University through the affiliated institution within 30 days from the cut-off date prescribed for the course for admission. The applications should have date of admission of the course.

### 5 MIGRATION/TRANSFER OF CANDIDATE:

(a) A student studying in **Diploma In Cardiac Non Invasive Technology** can be allowed to migrate/transfer to another institution of Allied Health Science under the same or another University.

(b) Under extraordinary circumstances, the Vice Chancellor shall have the powers to place any migration/transfer he/she deems fit before the Governing Council and get its approval for grant of permission/ratification for Migration/Transfer to the candidates undergoing the course of study in affiliated institutions of this University.

### 6. COMMENCEMENT OF THE COURSE:

The course shall commence from 1st August of the academic year.

**7. MEDIUM OF INSTRUCTION:**

English shall be the Medium of Instruction for all the Subjects of study and for examinations of the **Diploma In Cardiac Non Invasive Technology.**

**8. CURRICULUM**:

The Curriculum and the syllabus for the course shall be as prescribed in these regulations and are subject to modifications by the Standing Academic Board from time to time.

**9. DURATION OF THE COURSE**:

The duration of certified study for the **Diploma In Cardiac Non Invasive Technology** shall be over a period of two academic years.

**10. RE-ADMISSION AFTER BREAK OF STUDY:**

The regulations for re-admission are as per the University Common Regulation for Re-admission after break of study for all courses.

**11. WORKING DAYS IN THE ACADEMIC YEAR:**

Each academic year shall consist of not less than 240 working days.

**12. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATION**:

- No candidate shall be permitted to appear in any one of the parts of **Diploma In Cardiac Non Invasive Technology** Examinations unless he/she has attended the course in the subject for the prescribed period in an affiliated institution recognized by this University and produce the necessary certificate of study, attendance and satisfactory conduct from the Head of the institution.
-  A candidate is required to put in a minimum of 85% of attendance in both theory and practical separately in each subject before admission to the examinations.

**13 CONDONATION OF LACK OF ATTENDANCE:**

There shall be no condonation of lack of attendance.

**14 VACATIONS:**

Public holidays are applicable.

**15. INTERNAL ASSESSMENT MARKS:**

The Internal Assessment should consist of the following points for evaluation:-

i) Theory

ii) Practical / Clinical

iii) Viva

(a) A minimum of two written examinations shall be conducted in each subject during a year and the best marks of the one performance shall be taken into consideration for the award of Internal Assessment marks.

(b) A minimum of one practical examination shall be conducted in each subject (wherever practical has been included in the curriculum) and grades of ongoing clinical evaluation to be considered for the award of Internal Assessment marks.

**16. CUT-OFF DATES FOR ADMISSION TO EXAMINATIONS**:

(i) 30th September of the academic year concerned

(ii) The candidates admitted up to 30th September of the academic year shall be registered to take up the 1st year examination during August of the next year.

(iii) All kinds of admission shall be completed on or before 30th September of the academic year. There shall not be any admission after 30th September even if seats are vacant.

**17. DURATION:**

| | |
|---|---|
| Course Duration | - 2 years |
| Weeks per year | - 52 weeks |
| Vacation | - 2 weeks |
| Hours per week | - 30 hours |
| Hours per academic year | - 1440 hours |
| No. of working days per year | - 240 days |

**18. COMMENCEMENT OF THE EXAMINAITONS:**

1st August / 1st February

If the date of commencement of examination falls on Saturdays / Sundays or declared Public Holidays, the examination shall begin on the next working day.

The University paper will be awarded for 100 marks and Internal 50 marks.

**19. MARKS QUALIFYING FOR PASS:**

50% of marks in the University Theory Examinations

50% of marks in the University Practical Examinations

50% of marks in the subject where internal evaluation alone is conducted

50% of marks in aggregate in Theory, Practical I.A. & Oral taken together

## 20. CARRY OVER OF FAILED SUBJECTS:

(1) A candidate has to pass in theory and practical examinations separately in each of the paper

(2) If a candidate fails in either theory or practical examinations, he/she has to reappear for both (theory and practical)

(3) The candidate has to successfully the course in double the duration of the course (i.e. 4 years from the date of joining)

## 21. PRACTICAL EXAMINATION

Maximum number of candidates for practical examination should not exceed 25 per day. An examiner should be a lecturer or above in any of the affiliated institutions of Allied Health Sciences.

## 22. NUMBER OF EXAMINERS

One internal and one external examiner should jointly conduct practical/ oral examination for each student

## 23. REVALUATION/RETOTALLING OF ANSWER PAPERS:

Revaluation/ retotalling of answer papers is not permitted.

## Diploma in Cardiac Non Invasive Technology

**BRIEF SUBJECT TITLE TO BE COVERED**

| **External Subjects** | **Internal subjects** |
|---|---|
| **1st year** | |
| **Paper I- Human biology And introduction to cardiology** | |
| Anatomy, Physiology & Biochemistry, Pharmacology | Spoken English & Communication |
| Introduction to Cardiovascular Diseases | Basics of Computer Science |
| | |
| **2nd year** | |
| **Paper II- Cardiovascular Investigations** | |
| Basic Cardiovascular Investigations | |
| Advanced Cardiovascular Investigations | |
| | |

**NOTE:** For the supportive subjects Internal Examination to be conducted by the institute conducting the course and marks should be submitted to the University.

**Paper I - Human biology and Introduction to cardiology**

**ANATOMY, PHYSIOLOGY & BIOCHEMISTRY**

**ANATOMY & PHYSIOLOGY**
**Course Hours (Theory): 70 hrs**
**Course Hours (Practicum): 30hrs**

**Module 1: Introduction to anatomy**

Scope of Anatomy and Physiology - Definitions and Terms in Anatomy and Physiology- Structure and function of human cell - Elementary tissues of human body- Brief account on Composition of Blood - functions of blood elements - Blood Group and coagulation of blood.

**Module 2: Cardio Vascular System**

Structure and functions of various parts of the heart, arterial and venous system, brief account on common cardiovascular disorders

**Module 3:Respiratory System**

various parts of respiratory system and their functions, Physiology of Respiration

**Module 4: Digestive System**

names and various parts of digestive system-Liver, Spleen, Gall Bladder, Pancreas, Buccal Cavity, Pharynx, Oesophagus, Stomach, intestine etc.-physiology of digestion and absorption

**Module 5: Urinary System**

various parts of urinary system and its function-structure and function of kidneys-physiology of urine formation - pathophysiology of renal disease and edema

**Module 6: Reproductive System**

physiology and anatomy of Male & Female reproductive system-Prostate & Uterus & Ovaries etc

**Module 7: Musculoskeletal System**

Classification of bones & joints, structure of skeleton –structure of skeletal muscle –physiology of muscle contraction

**Module 8: Nervous System**

various parts of nervous system- Brain and its parts –functions of nervous system - Spinal Cord & Nerves

**Module 8: Ear, Nose, Throat and Eye**

Elementary knowledge of structure and functions of organs of taste, smell, hearing, vision

**Module 9: Endocrine System**

Endocrine glands ,their hormones and functions-Thyroid, Parathyroid, Suprarenal, Pituitary, pituitary and Thymus

**Module 10: Haemopoietic and Lymphatic System**

Name of the blood vessels & lymph gland locations

**Module 11: Surface Anatomy & Surface Markings of Human Body Practicals**

- Study of Human Skeleton parts with skeletal models..
- Study with charts and models of all organ systems mentioned above.
- Microscopic slides examination of elementary human tissues, cells.

**REFERENCES**

1. Solomon. E.A., (2008) Introduction to Human Anatomy and Physiology 3rd Ed, Saunders: St Louis.

2. Chaursia, B.D., & Garg, K., (2012) *Human Anatomy Regional and Applied.* CBS Publications: New Delhi

3. T.S. Ranganathan – *A text book of Human Anatomy*

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

## BIOCHEMISTRY

**Course Hours (Theory): 30 hrs**

**Course Hours (Practicum): 20 hrs**

**COURSE OBJECTIVES:** On completion of this course the students will be able to:

1. Define biochemistry and explain the major complex biomolecules of the cell.
2. Enumerate the chemical structure, classification and functions of proteins, lipids and carbohydrates.
3. Comprehend the classification & function of nucleic acids and enzymes.
4. Explain the biochemical structure of vitamins, its classification and the functions of vitamins and minerals.
5. List the various hormones, its action and function.
6. Describe acids and bases, the mechanism of homeostasis and acid base balance

**BIOCHEMISTRY**

**Module 1: Carbohydrates**

Glucose and Glycogen Metabolism

**Module 2: Proteins:**

Classification of proteins and functions

**Module 3: Lipids:**

Classification of lipids and functions

**Module 4: Enzymes**

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

**Module 5: 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

**Module 6 : Acids and bases:**

Definition, pH, Henderson – Hasselbalch equation, Buffers, Indicators, Normality, Molarity, Molality

**BIOCHEMISTRY SYLLABUS FOR PRACTICALS**

1 Benedict's test

2. Heat coagulation tests

**REFERENCES**


1. Teitz, *Clinical Chemistry*. W.B. Saunders Company Harcourt (India) Private Limited New Delhi.
2. Vasudevan D. & Sree Kumari S., *Text Book of Bio Chemistry for Medical Students*, Jaypee Brothers, New Delhi.
3. Biochemistry, U. Satyanarayan, Books and Allied (P) Ltd. Kolkata-India
4. Das Debajyothi, *Biochemistry*, Academic Publishers Calcutta.


**PHARMACOLOGY**

**Course Hours (Theory): 50 hrs**
**Course Hours (Practical): 50 hrs**

**COURSE OBJECTIVES**: On completion of the course the students will be able to:

1. Define pharmacology and state the general concepts in pharmacology
2. List the common drugs used for the treatment of cardiovascular diseases..
3. Describe the various drugs used for the treatment of heart diseases: which includes antihypertensives, anti-failure drugs, ionotropes, diuretics and anti – arrhythmics.
4. List, classify and describe in detail the various anti – hypertensive's, their action, indication, side effects and adverse drug responses.
5. Comprehend the need for anti anginals. List the action, indication, dosage and route of administration of the same.

6. Comprehend and describe the action, indication, dosage, route of administration & side effects of thrombolytics.
7. State the need for lipid lowering drugs their mode of action, side effect and dosages.
8. List the various anti failure drugs used and its mode of action.
9. Enumerate the use of morphine in the management of myocardial infarction.
10. Detail the mode of action and indications for anaesthetics and sedative use.

**PHARMACOLOGY**

**Module 1: General concepts In Pharmacology**

Definition of Pharmacology - general concepts about pharmacodynamics and Pharmacokinetics. - Principles involved in drug activity. - Autonomic nerves system. Anatomy & functional organisation. List of drugs acting an ANS including dose, route of administration, indications, contra indications and adverse – effects

**Module 2: Cardiovascular drugs**

Enumerate the mode of action, side effects, complication and therapeutic uses of the following drugs.

- Anti-anginal agents
- Anti-failure agents
- Anti-hypertensive drugs
- Anti- arrhythmic agents
- Antithrombotic agents
- Lipid lowering and anti-atherosclerotic drugs
- Miscellaneous drugs

**REFERENCES**

1. Tripathi K.D. (2008*) Essentials of Pharmacology* 6th Ed, Jaypee Brothers medical publishers: New Delhi
2. Rang H.P., (1995) *Pharmacology* 3rd Ed, Churchill Livingstone: Michigan
3. Tripathi, K.D.,(2010). *Pharmacological Classification of drugs, doses and Preparations* 4th Ed, Jaypee Brothers medical publishers: New Delhi
4. Ajay, P., Medhi - Bikash (2010). *Pharmacology,* Jaypee Brothers medical publishers: New Delhi

## INTRODUCTION TO CARDIOVASCULAR DISEASES

**Course Hours (Theory): 100 hrs**

**COURSE OBJECTIVES:** On completion of the course the student will be able to:

1. Comprehend the common valvular heart disease, related pathophysiology, investigations and the appropriate management of the same.
2. Detail the pathophysiology of coronary heart disease its management and complications of a myocardial infarction.
3. List the various diagnostic investigations done for coronary artery disease.
4. Detail the medical management of hypertension.
5. Explain the etiology, pathophysiology and diagnostic studies for the determination of heart failure.
6. Describe the characteristics of the various types of arrhythmias and state the management of the same.
7. Enumerate on the types of congenital abnormalities of the heart, aetiology, diagnosis, and medical management.

## INTRODUCTION TO CARDIOVASCULAR DISEASES

**Module 1: Valvular heart disease**

Aetiology - Pathology - Pathophysiology - Microbiology - Clinical manifestations - Medical and Surgical management of - Acquired valvular heart disease - Rheumatic fever and rheumatic heart disease - Aortic stenosis - Aortic regurgitation - Mitral valve disease - Mitral stenosis -Mitral regulation -Mitral valve disease -Tricuspid valve disease - Infective endocarditis - Valvuloplasty and valve surgery

**Module 2: Coronary Artery Disease**

Aetiology - Pathophysiology and clinical recognition of - Angina Pectoris - Symptomatic and asymptomatic myocardial ischemias - Types and locations of myocardial infarction - Thrombolytic therapy - Medical treatment - Percutaneous interventions - Surgical treatment - Cardiac rehabilitation Complications of Coronary heart disease & Myocardial Infarction

**Module 3: Systemic hypertension**

Aetiology, Pathophysiology, Medical management & complications of Essential and secondary hypertension

**Module 4: Heart failure**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of heart failure

**Module 5: Myocardial diseases**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Dilated cardiomyopathy - Hypertrophic cardiomyopathy - Restrictive cardiomyopathy - Myocarditis

**Module 6. Pericardial Diseases**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of:- Pericardial effusion - Constrictive pericarditis - Cardiac tamponade

**Module 7: Electrical disturbances of the heart**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Sinus node dysfunction - Arrhythmias and conduction disturbances - Treatment of arrhythmias – pharmacological, radiofrequency ablation and surgery.

**Module 8: - Pulmonary hypertension**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Primary pulmonary hypertension - Pulmonary thromboembolism

**Module 9: Peripheral Vascular Diseases**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Atherosclerotic peripheral vascular disease - Aortic aneurysms - Aortic dissection - Takayasu arteritis

**Module 10: Congenital heart disease**

Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Acyanotic heart disease - Atrial septal defect - Ventricular septal defect - Patent ductus arteriosus - Congenital valvular disease - Coarctation of aorta
Definition - Aetiology - Types - Pathophysiology - Clinical Manifestations - Surgical and medical treatment of: - Cyanotic congenital heart disease - Tetralogy of Fallot - Double outlet right ventricle - Pulmonary atresia - Transposition of great arteries - Truncus arteriousus - Total anomalous pulmonary venous connection

**REFERENCES**


1. Robert O. Bonow, Douglas L. Mann, Douglas P. Zipes, Peter Libby *Braunwald's Heart Disease E-Book: A Textbook of Cardiovascular Medicine, 2-Volume Set* Elsevier Health Sciences, 2011
2. J. Larry Durstine, Geoffrey E. Moore, Michael J. LaMonte *Pollock's Textbook of Cardiovascular Disease and Rehabilitation* Human Kinetics, 2008
3. Ra-id Abdulla *Heart Diseases in Children: A Pediatrician's Guide* Springer, 2011

## Paper II- CARDIOVASCULAR INVESTIGATIONS

## BASIC CARDIOVASCULAR INVESTIGATIONS

**Course Hours (Theory): 200 hrs**
**Course Hours (Practicum): 400 hrs**

**COURSE OBJECTIVES**: On completion of the course the student will be able to:

1. Define an ECG and state the fundamental principles of electrocardiography.
2. Calculate the heart rate from an ECG tracing.
3. Identify the various planes and Axis of an ECG.
4. Enumerate on the working of an ECG machine, the various parts and the maintenance of the same.
5. List the various ECG Monitoring systems.
6. Independently obtain a 12 lead ECG and comprehend the proper technique for applying electrodes, selecting leads and obtaining rhythm strips.
7. Comprehend the steps of ECG interpretation including the properties of a normal sinus rhythm.
8. Describe the properties and characteristics of each type of arrhythmia.
9. Enumerate the cause, significance and treatment and assessment findings associated with each arrhythmia.
10. Interpret sinus node arrhythmias, atrial and ventricular arrhythmias on an ECG.
11. Describe the need for a holter monitor.
12. Enumerate the technologist's role in maintaining a holter monitor.
13. Describe the Procedure for Holter monitor.
14. Detail the indications for a tread mill test.
15. Explain the physiology of exercise testing the indications, contraindications and the precautions to be taken for the tread mill test.
16. Conduct independently a tread mill test.
17. List the various emergencies that can be expected during a tread mill test.

## BASIC CARDIOVASCULAR INVESTIGATIONS

### Module 1: Basic Electrocardiography (ECG)

Fundamental principles of electrocardiography - Cardiac electrical field generation during activation - Cardiac electrical field generation during ventricular recovery - Leads and their position - Standard limb leads - Precordial leads and the Wilson central terminal - Augmented limb leads - The hexaxial reference frame and electrical axis -Recording adult and pediatric ECGs - Normal electrocardiogram-explaining PQRST - Normal timings - Heart rate calculations - Sinus tachycardia - Sinus bradycardia - Sinus arrhythmia- Removal of leads

**Module 2: Advanced Electrocardiography (ECG)**

Interpretation of and ECG strip - Steps involved - ECG abnormalities - Atrial arrhythmias - Left atrial abnormality - Right atrial abnormality - Ventricular arrhythmias - Left ventricular hypertrophy and enlargement - Right ventricular hypertrophy and enlargement - Intraventricular conduction delays - Left anterior fascicular block - Left posterior fascicular block - Left bundle branch block - Right bundle branch block - Myocardial ischemia and infarction - Repolarization (ST-T wave) abnormalities - Evolution of electrocardiographic changes - Non-infarction Q waves - Primary and seconday T wave change - Electrolyte and metabolic ECG abnormalities - Cardiac arrhythmias - Premature atrial contraction - Supra-ventricular tachycardias - Atrial flutter/fibrillation - Junctional rhythm - Accelerated junctional rhythm - Ventricular premature beats - Ventricular Tachycardia/Ventricular fibrillation - Torsedes de pointes - Idioventricular rhythm - Accelerated idioventricular rhythm - Atrio Ventricular block - First degree - Second degree-Mobitz type 1 and 2 block - Complete heart block - A technologist's role in ECG interpretation - Maintenance and Care of the ECG Machine.

**Module 3: Holter**

Introduction to the Holter test - Indications for a holter test - Precautions to be taken during holter testing - Principles of Holter Recording - Connections of the Holter recorder - Holter Analysis - Guidelines for ambulatory electrocardiography - Procedure for a Holter test.

**Module 4: Treadmill Exercise Stress Testing**

History Taking- Exercise physiology - Exercise protocols - Lead systems - Patient preparation - ST segment displacement – types and measurement - Non-electrocardiographic observations - Exercise test indications, contra-indications and precautions- Recognition of patient risk factors associated with exercise tolerance - Cardiac arrhythmias and conduction disturbances during stress testing - Emergencies in the stress testing laboratory- Care of equipment (Set up &calibration , identification of associated work load measurements such as MET and aerobic impairment) - Absolute indicators to cancel or discontinue the test – Recognition of results (positive, negative, false positive, and false negative results)

**BASIC CARDIOVASCULAR INVESTIGATIONS**

1. Recording a 12 lead ECG and a rhythm strip
2. Steps in interpretation of an ECG
3. Identification of various abnormal ECG rhythms
4. Identification of various atrial & ventricular arrhythmias.
5. Maintenance and care of ECG machines.
6. Conducting a Holter test
7. Interpretation of a Holter test
8. Conducting a Tread Mill test
9. Spotting cardiac arrhythmias and conduction abnormalities.

**REFERENCES**

1. Dhanjoo N. Ghista Noninvasive *Cardiac assessment technology*

2. Alberto Benchimol - *Non-invasive diagnostic techniques in cardiology* Williams & Wilkins, 1981

3. Atul Luthra *ECG Made Easy* JP Medical Ltd, 2012

4. Malcolm S. Thaler *The Only EKG Book You'll Ever Need*, Volume 365 Lippincott Williams & Wilkins, 2009

**ADVANCED CARDIOVASCULAR INVESTIGATIONS**

**Course Hours (Theory): 200 hrs**
**Course Hours (Practicum): 400 hrs**

**COURSE OBJECTIVES**: On completion of the course the student will be able to:

1. Comprehend the basics of imaging physics.
2. Describe the basic principles behind echocardiography.
3. Utilize the echocardiography machine to identify various intra - cardiac and regional wall abnormalities.
4. List the various measurements that are done by the echocardiography machine.
5. Perform independently screening ECHO and identify valvular heart disease and other cardiac abnormalities.
6. State the various equipment used to measure cardiac parameters.
7. Independently maintain equipments such as the ECHO machine, Defibrillators, cardiac monitors.
8. Identify cardiac rhythms that can be defibrillated.
9. Perform independently defibrillation in an emergency and also participate in cardio - version.
10. State the various equipments used for a cardiac catheterization lab.
11. List the various types of catheters used for a PTCA.
12. Enumerates on the tecnologist's responsibility before, during and post cardic catheterization procedures.
13. States the various cardiac catheterization procedures and is familiar with his/her role during each of those procedures.
14. Describes the process of myocardial imaging and processing of the image.

**ADVANCED CARDIOVASCULAR INVESTIGATIONS**

**Module 1: Introduction to Imaging Physics**

Types and working principle - Fluoroscopy - Angiography and Cine Radiography - Conventional and Digital Radiography - Ultrasound - Mammography - Computed Tomography - Magnetic Resonance Imaging

**Module 2: Echocardiography Part 1**

Development and principle - Transducers and its types - Views used in transthoracic echocardiography - M- mode and 2D transthoracic echocardiography - Doppler echocardiography: Principle - Pulsed, continuous wave and colour - Measurement of cardiac dimensions - Evaluation of systolic left ventricular function and methods - Evaluation of diastolic left ventricular function and grading - Regional wall motion abnormalities - Hemodynamic assessment - Stroke volume and cardiac output assessment - Regurgitant volume and fraction - Pulmonary – systemic flow ratio - Transvalvular gradients - Pressure half time - Continuity equation - Intracardiac pressure- Assist Cardiologist in obtaining images of Heart- Positioning of patient for testing.

**Module 3: Echocardiography Part 2**

Echocardiography in Valvular heart disease - Mitral stenosis - Mitral regurgitation - Mitral valve prolapse - Aortic stenosis - Aortic regurgitation - Pulmonary stenosis - Pulmonary regurgitation - Infective endocarditis - Prosthetic valve assessment - Pulmonary hypertension - Echocardiography in Cardiomyopathies: - Dilated - Hypertrophic - Restrictive - Constrictive pericarditis - Pericardial effusion and cardiac tamponade - Left atrial thrombus - Left atrial myxoma - Complications of MI - Transoesophageal echocardiography - Paediatric echocardiography - Segmental analysis - Cardiac malpoistions - Atrial segment - Situs solitus - Situs inversus - Situs ambigus - Ventricular segment and spatial position - Atrioventricular connections - Arterial segment and spatial relation - Ventriculo arterial segment - Congenital heart disease - Atrial septal defect - Ventricular septal defect - Patent ductus arteriosus - Tetralogy of Fallot - Coarctation of aorta - Transposition of great arteries- Knowledge about the equipment – Roles and responsibilities of Cardiac Technologist in assisting with Echocardiography.

**Module 4: Medical Electronics, Biophysics & Computer Usage Relevant to Cardiac Technology**

Introduction to hemodynamic monitoring - concepts of hemodynamic monitoring **-** Hemodynamic monitors - Blood pressure recording - Pulse oximetry - End tidal carbondioxide monitoring - Ventilators - introduction to ventilators - indications for use - modes of ventilation - Medical ultrasound and Doppler - Electrocardiographic processing and display system - Direct Current (DC) shock - Definition of a defibrillator - Indications Defibrillator use and procedure - types - Monophasic and biphasic shock - Technique of cardioversion - Indications for cardioversion - Measures to reduce radiation exposure

**Module 5: Introduction To Cardiac Catheterization**

Equipments and catheters - Catheter cleaning and packing - Setting up the cardiac catheterization laboratory for a diagnostic study - Table movement - Angioscope - X-ray generating system - Image intensifier - C-arm - Contrast pressure injector - Hemoximeter - Mingograf - Transducer - Manifold - Pressure line- Sheath - Percutaneous transluminal coronary angioplasty – Indications, Contraindications, Instruments, & Procedure guidelines. Percutaneous transvenous mitral commisurrotomy – Indications, Contraindications, Instruments & Procedure guidelines. Post cardiac catheterization management. Coronary angiography - Coronary angiographic catheters - Angiographic views in coronary angiography - Left Ventriculography – catheters, views, use of the injector - Atrial septal defect – Oximetry, pressure data, device closure procedure - Ventricular septal defect -device closure procedure - Patent ductus arteriosus -device closure procedure - Shunt calculations. Introduction to Pacemakers - definition - Pacemaker indicatons - Modes - Types - Parts of a Pacemaker - Permanent pacemaker – Indications, Contraindications, procedure.

**Module 6: Introduction to Nuclear Cardiology**

Radiopharmaceuticals - Patient preparation - Myocardial perfusion imaging - First pass cardiac study - Radionuclide ventriculography - multiple gated acquisitions (MUGA) scans – Contraindications

**Module 7: General principle of hospital practice**

Hospital structure and organization, Care of Patient , Basic Assessment Skills, First aid & Basic Life Support, Maintenance of Hygiene & Infection Control Practices, Principles of asepsis, Maintenance of Medications in the department, Specialized Investigations - Care of Patients, Medico - Legal Issues

**ADVANCED CARDIOVASCULAR INVESTIGATIONS**

1. Parts of an ultrasound
2. Monitoring of hemodynamic parameters
3. Identify Parts of a defibrillator
4. Basic Life support
5. Advanced Cardiac Life Support
6. Identify rhythms for defibrillation
7. Perform the procedure for defibrillation.
6. Setting up of a cardiac catheterization unit for PTCA / Angiography
7. Identification of the various instruments used in a cath study / BMV / PTCA
8. Packing and washing of all equipments in a cardiac catheterization lab.
9. Perform an ECHO 2D on a patient - identification of various abnormalities.
10. The student must perform a Screening ECHO / Bedside ECHO.

11. The student must be exposed to various abnormalities that can be identified by using the ECHO.
12. Independently maintain the cath lab table and its movements

## REFERENCES


1. Donald S. Baim *Grossman's Cardiac Catheterization, Angiography, and Intervention,* Volume 1 Lippincott Williams & Wilkins, 2005

2. Morton L. Kern, Morton J. Kern *The Cardiac Catheterization Handbook* Elsevier Health Sciences, 2011

3. Patrick Kay, Manel Sabate, Marco A. Costa *Cardiac Catheterization and Percutaenous Interventions* Taylor & Francis, 2004

## INTERNAL SUBJECTS

## SPOKEN ENGLISH & COMMUNICATION

**Course Hours (Theory):50 hours**
**Course Hours (Practicum): 25 hrs**

**COURSE OBJECTIVES:** On completion of the course the students will be able to:

1. Improve their fluency in English.
2. Participate in class discussions and question-answer sessions with confidence
3. Improve their vocabulary and utilize English as the only medium of communication.
4. Comprehend the basics of letter writing and formatting of a letter.
5. Understand the various types of letters used for written communication.
6. Effectively write a report using grammatical sentences.

## SPOKEN ENGLISH & COMMUNICATION

### Module 1: Communication

Definition of communication, need for communication its classification and purpose. Various barriers of communication and major difficulties in communication. The characteristics of successful communication – The seven C's. The human needs and communication "Mind mapping". Information communication. Communication in the health care set up.

### Module 2: Comprehension Passage

Reading purposefully **-** Understanding what is read - Drawing conclusion - Finding and analysis

### Module 3: Explaining

How to explain clearly - Defining and giving reasons - Explaining differences - Explaining procedures - Giving directions

### Module 4: letter writing

Types of letters – Business letters - How to construct correctly - Formal language – Address – Salutation – Body – Conclusion- Providing information to superiors in written form.

### Module 5: Report writing

Reporting an accident - Reporting what happened at a session - Reporting what happened at a meeting

### Module 6 : Conversational English Exercises

Self introduction, Explanation of various procedures, Reporting of any mishap, Explaining to a patient, Conversing with the doctor on patient care status.

## SPOKEN ENGLISH & COMMUNICATION

**Module 1: Communication**

Role play / skit as a practical exercise

**Module 2: Comprehension Passage**

Comprehension passage as an exercise

**Module 3: Writing a letters**

Formulate a business letter and a letter to a friend / family

**Module 4: Report writing**

Write a report on your recent visit to a place of interest.

### REFERENCES


1. English Grammar Collins, Birmingham University, International Language Data Base, Rupa & Co.
2. Wren and Martin - Grammar and Composition, 1989, Chanda & Co, Delhi
3. Letters for all Occasions. A S Myers. Pub - Harper Perennial
4. Spoken English V. Shasikumar and P V Dhanija. Pub. By: Tata Mcgraw Hill, New Delhi


## BASICS OF COMPUTER SCIENCE

**Course Hours (Theory): 50 hours**

**Course Hours (Practicum): 25 hrs**

**COURSE OBJECTIVES:** On completion of the course the students will be able to

1. Comprehend the parts of a computer and the different operating systems.
2. Utilize the MS word for typing letters and text.
3. Effectively use features in MS word to manipulate text and insert pictures and various fonts.
4. Prepare and use effectively a PowerPoint presentation.
5. Utilize the internet for web searches and e- mail
6. Appreciate the contribution of HIS to the healthcare industry.
7. Describe the uses of the hospital information system

## Basics of Computer

### Module 1: Introduction to the Computer

Parts of a computer, I/O devices – memories – RAM and ROM. Networking – LAN, WAN, MAN(only basic ideas)

### Module 2: Introduction to Microsoft Word

Typing text in MS word, manipulating text, formatting the text & using different font sizes, bold, italics. Using Bullets and numbering, insertion of pictures, & file insertion. Aligning of the text and justify.

### Module 3: Microsoft PowerPoint

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

### Module 4: Introduction to the Internet

Definition about the World Wide Web & brief history. Using search engine and beginning 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

### Module 5: Introduction to the Hospital Information System

Definition of Hospital Information system, Architecture of a HIS, aim and uses of HIS, types of HIS Benefits of using a hospital information system.

## Basics of Computer (Practicum)

### Module 1: Introduction to Microsoft Word

Type a text document, save the document. Align the text with different formats using Microsoft Word. Inserting a table ensuring proper alignment of the table using MS word

### Module 2: Microsoft PowerPoint

Preparing a slide show with transition, animation and sound effect using MS – PowerPoint. Customizing the slide show by inserting pictures and tables in the slides using MS – PowerPoint.

### Module 3: Introduction to the Internet

Create an e – mail account. Use the internet to search for a subject of interest.

## REFERENCES:


1. Murray H., (2003) Teach yourself basic computer skills, Trans Atlantic publishers.
2. Bennet A., (1996) Computers: Technology, Electronics and Internet, Holy Hail Publishers
3. Prokosh H. U., Dudeck, J., (1995) Hospital Information Systems: Design and Development Characteristics, Impact and Future Architecture, Elsevier : St Louis.

**Postings during 6 months Internship:-**

**3 months – ECHO room**

**1 month - ICCU**

**2 months – Holter, Ambulatory BP – Ambulatory ECG, Treadmill Test**

**Programme structure**

| Subjects | Total hours | | |
|---|---|---|---|
| | **Theory** | **Practical** | **Clinical** |
| **1st year** | | | |
| Anatomy, Physiology , Biochemistry, Pharmacology | 150 | 100 | 50 |
| Introduction to Cardiovascular Diseases | 200 | | 100 |
| Spoken English & Communication | 50 | 25 | |
| Basics of Computer Science | 50 | 25 | |
| **Total: 725 hrs** | | | |
| **2nd year** | | | |
| Basic Cardiovascular Investigations | 200 | | 400 |
| Advanced Cardiovascular Investigations | 250 | | 400 |
| **Total: 1250 hrs** | | | |
| | | | |

## SCHEME OF EXAMINATION

### FIRST YEAR

| Theory Subject Title | University Theory Exam | | Practical Marks | | VIVA | | Internal assessment | |
|---|---|---|---|---|---|---|---|---|
| | Max | Min | Max | Min | Max | Min | Max | Min |
| Anatomy, Physiology, Biochemistry & Pharmacology | 100 | 50 | - | - | - | - | 50 | 25 |
| Introduction to Cardiovascular Diseases | 100 | 50 | 100 | 50 | 50 | 25 | 50 | 25 |

### SECOND YEAR

| Theory Subject Title | University Theory Exam | | Practical Marks | | VIVA | | Internal Assessment | |
|---|---|---|---|---|---|---|---|---|
| | Max | Min | Max | Min | Max | Min | Max | Min |
| Basic Cardiovascular Investigations | 100 | 50 | - | - | - | - | 50 | 25 |
| Advanced Cardiovascular Investigations | 100 | 50 | 100 | 50 | 50 | 25 | 50 | 25 |

## Internal Assessment

| Internal Assessment | Marks |
|---|---|
| Theory | 20 |
| Practical | 20 |
| Log/Record work | 10 |
| **Total** | **50** |

## Question Paper Pattern

| | No. of questions | Marks per question | Total Marks |
|---|---|---|---|
| **Essays** | 3 | 10 | 30 |
| **Short Notes** | 10 | 5 | 50 |
| **Short** | 10 | 2 | 20 |
| | | **Total** | **100** |