Krishna Institute of Medical Sciences Deemed to be University, Karad

Name of the Programme–B.Sc Cardiac Care Course

COURSE OVERVIEW

Introduction: The three year B.Sc. Cardiac Care course will empower the candidate to assist cardiovascular diagnostic and treatment techniques, at the direction of a qualified physician. This programme is designed to cover all aspects of cardiovascular disease management and care. It involves learning of complex diagnostic and therapeutic procedures that involve use of various catheterization equipment, computer hardware, tools, machines and pharmacological agents. This program enables students to acquire skills like recording ECG, assisting echocardiography, TMT, Holter, cardiac catheterization for management of various cardiac disorders. It is a 3 years full time program inclusive of 6 semesters scheduled 6 months each.

Krishna Institute of Medical Sciences Deemed to be University, Karad

Name of the Programme–B.Sc Cardiac Care Course

Semester - I

B.Sc. Cardiac Care Course SEMESTER I			
Sr. Number	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a – Theory			
1) Paper I	**(Lectures ,Tutorials) Human Anatomy I**	45	3
2)Paper II	**(Lectures ,Tutorials) Human Physiology I**	45	3
3)Paper III	**(Lectures ,Tutorials) Biochemistry I**	45	3
4)Paper IV	**(Lectures ,Tutorials) Communication skills**	45	3
b – Practical			
1)Paper I	**Human Anatomy I**	60	2
2)Paper II	**Human Physiology I**	60	2
3)Paper III	**Biochemistry I**	60	2
4)Paper IV	**Basic Life Support Science**	60	2
B. Discipline specific elective (ANY ONE)			
a – Theory			
1.		----	-----
2.			
b – Practical			
1.		------	
2.			-
C. Generic Elective.(Any One) Stress Management, Personality development			
a.- **Theory**			
1.	**Stress Management**	30	2
2.	**Personality development**		
b – **Practical**			
1.	**Stress Management**	90	3
2.	**Personality development**		

D **Case studies**		30	1
	Total	570	26

ANATOMY

Anatomy I

- **a.** Basic and Introduction to anatomy, descriptive terms, anatomical planes, types of tissues
- **b.** Basic and Introduction of Respiratory system
- **c.** Basic and Introduction Circulatory system
- **d.** Basic and Introduction to bones
- **e.** Basic and Introduction to joints
- **f.** Basic Introduction to muscular system
- **g.** Basic Introduction to cardiovascular system
- **h.** Basic and Introduction to digestive system
- **i.** Basic and Introduction to excretory system
- **j.** Basic and Introduction to Endo cardio system
- **k.** Basic and Introduction to lymphatic system
- **l.** Introduction to nervous system

PHYSIOLOGY

Physiology –I

a. Basic and Introduction to General Physiology
b. Basic and Introduction to Blood - Composition, properties and functions of Blood,
c. Basic and Introduction to Cardio vascular system
d. Basic and Introduction to Digestive system
e. Basic and Introduction to Respiratory System
f. Basic and Introduction to Muscle nerve physiology
g. Basic and Introduction to Excretion

BIOCHEMISTRY

Biochemistry – I

- **a.** Basic Introduction Bimolecular & cells
- **b.** Carbohydrates
- **c.** Proteins
- **d.** Lipids
- **e.** Enzymes
- **f.** Vitamin & minerals
- **g.** Hormones Acid & bases
- **h.** Nucleic acid

COMMUNICATION SKILL

a. Role of communication Defining Communication Classification of communication Purpose of communication

b. Major difficulties in communication

c. Barriers to communication

d. Characteristics of successful communication – The seven Cs

e. Communication at the work place

f. Human needs and communication "Mind mapping" Information communication

g. Communication with team members in OT and ICU

h. Communication with Patient and patient's Relatives

SEMESTER II

Second Semester

B.Sc. Cardiac Care course	**SEMESTER II**		
Sr. Number	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a. THEORY			
1) Paper I	**(Lectures ,Tutorials) Anatomy II**	45	3
2)Paper II	**(Lectures ,Tutorials) Physiology II**	45	3
3)Paper III	**(Lectures ,Tutorials) Microbiology**	45	3
4)Paper IV	**(Lectures ,Tutorials) Basic Pathology and Hematology**	45	3
b. Practical			
1)Paper I	**Anatomy II**	60	2
2)Paper II	**Physiology II**	60	2
3)Paper III	**Microbiology**	60	2
4)Paper IV	**Basic Pathology and Hematology**	60	2
B. Discipline specific elective (Any One) Select any one			
a - **Theory**			
1.	Soft Skill development	60	4
2.	Enhancing soft skills and personality		
b - **Practical**			
1.	Soft Skill development	90	3
2.	Enhancing soft skills and personality		
C. GENERIC ELECTIVE.(ANY ONE)			
A - **Theory**			
1.		-----	-----
b - **Practice**			
1.		-----	-----
D. Case studies		-----	---
	Total	570	27

Anatomy II

a. Introduction to thorax, bony thorax, dorsal vertebrae, intercostalspaces
b. Joints of thorax and movements
c. Mediastinum: definition, boundaries, subdivisions and contents
d. Pleura, lungs
e. Heart: external and internal features, blood and nerve supply
f. Arch of aorta, superior vena cava, brachiocephalic vein, trachea andthymus
g. Oesophagus, descending aorta, sympathetic trunk, azygos system

Physiology-II

1. Blood
   a. Composition and function of blood
   b. Red blood cells: morphology, formation, normal counts, functions
   c. White blood cells: morphology, formation, normal counts, functions
   d. Platelets: morphology, formation, normal counts, functions
   e. Hemoglobin: basic chemistry, function and fate of hemoglobin
   f. Blood clotting: definition, clotting factors, theories of clotting
   g. Blood group: ABO system, Rh system
   h. Blood volume and regulation
   i. Blood transfusion
2. Cardiovascular
   a. Structure and properties of cardiac muscle
   b. Cardiac cycle, conductive system, ECG
   c. Heart sounds
   d. Heart rate and regulation
   e. Cardiac output and regulation
   f. Blood pressure and regulation
   g. Regional circulation: cerebral, coronary, pulmonary, renal
   h. Effect of exercise on cardiovascular system
3. Respiration
   a. Structure and functions of respiratory system
   b. Mechanics of respiration: muscles, lungs and chest wall compliance, V/Qratio, surfactant
   c. Transport of gases: O_2 and CO_2
   d. Nervous and chemical regulation of respiration
   e. Hypoxia, cyanosis, and dyspnea
   f. Acid base balance
   g. Principles of lung function tests
   h. Artificial respiration
   i. Effect of exercise on respiratory system
   j. Defense mechanisms

Microbiology

- **a.** Concepts and Principles of Microbiology - Historical Perspective, Koch's Postulates, Importance of Microbiology, Microscopy, Classification of Microbes.
- **b.** General Characters of Microbes - Morphology, staining methods, Bacterial growth & nutrition, Culture media and culture methods +ABS, Collection of specimen, transport and processing, Antimicrobial mechanism and action, Drug Resistance minimization.
- **c.** Sterilization and Disinfection - Concept of sterilization, Disinfection asepsis, Physical methods of Sterilization, Chemical methods (Disinfection), OT Sterilization, Biological waste and Biosafety & Biohazard.
- **d.** Infection and Infection Control - Infection, Sources, portal of entry and exit,
- **e.** Standard (Universal) safety Precautions & hand hygiene, Hospital acquired infections & Hospital Infection Control
- **f.** Immunity - Types Classification, Antigen, Antibody – Definition and types, Ag-Ab reactions – Types and examples, Procedure of Investigation & Confidentiality, Immunoprophylaris – Types of vaccines, cold chain, Immunization Schedule.
- **g.** Systemic Bacteriology (Morphology, diseases caused, specimen collection & lists of laboratory tests) – Introduction, Gram Positive Cocci & Gram Negative Cocci, Enterobacteraecea& Gram negative bacilli, Mycobacteria, Anaerobic bacteria & Spirochaetes, Zoonotic diseases, Common Bacterial infections of eye.
- **h.** Mycology - Introduction, Classification, outline of lab diagnosis, List of Fungi causing: Common fungal infections of eyes, Superficial Mycoses, Deep mycoses & opportunistic , Fungi.

BASIC PATHOLOGY AND HEMATOLOGY

1. Introduction to Pathology
2. Working and maintenance of instruments
3. General principles of Haematology techniques, blood collection, anticoagulants, fixation, processing, routine staining, Haemoglobin, TLC, DLC, Peripheral smear (CBC report), platelet counts, cell counter working
4. General principles of Histopathology techniques collection, fixation, processing & routine staining
5. General principles of Cytopathology techniques collection, fixation, processing & routine staining
6. General principles of Clinical Pathology techniques sample collection, processing for routine test, normal urine & urine examination, urine strip, introductions to body fluids (Distinguish between Transudation and exudates)
7. General principles of Blood Bank techniques antigen, antibody, ABO & Rh system
8. General principles of Autopsy & Museum
9. General Pathology in cluding introduction to :

   Cell Injury (Reversible, Irreversible cell injury)
   Inflammation(Acute inflammation, cells, Chronic inflammation, granuloma and examples
   Circulatory disturbances(Thrombosis, Embolism ,Edema- ascetic, pleural, pericardial- effusions, Shock, Allergy, Anaphylaxis-Definition, Morphological features, And distinguishing features)
   Neoplasia (Definition of Anaplasia, dysplasia, metaplasia and metastasis and difference between benign and malignant lesions)
10. Systemic pathology basis and morphology of common disorders like:
    Anemia(types-Iron deficiency, megaloblastic, Aplastic-Etiology, Pathogenesis Investigation)-
    Leukemia (Acute and chronic, Peripheral smear), AIDS(Definition, Pathogenesis, Mode of transmission, Two Confirmatory test Tridot, Western blot), Hepatitis (Types, Etiology, Mode of spread)
    Malaria-(Mode of spread
    Tuberculosis-(Primary and secondary tb, Granuloma formation, Mode of transmission, Organs involved
11. Maintenance and medico legal importance of records and specimens, Lab information system(LIMS)
12. Biomedical Waste, Universal Safety Precaution(Protocol to be followed after -Needle injury, chemical injury

Third Semester

B.Sc. Cardiac Care course	**SEMESTER III**		
Sr. Number	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a. Theory			
1) Paper I	**(Lectures ,Tutorials) Basic Electrocardiography I**	30	2
2)Paper II	**(Lectures ,Tutorials) Basic Echocardiography I**	30	2
3)Paper III	**(Lectures ,Tutorials) Pharmacology related to cardiology**	30	2
4)Paper IV	**(Lectures ,Tutorials) Clinical Cardiology I**	30	2
b. Practical			
1)Paper I	**Basic Electrocardiography**	60	2
2)Paper II	**Basic Echocardiography**	60	2
3)Paper III	**Pharmacology related to cardiology**	60	2
4)Paper IV	**Clinical Cardiology**	60	2
B. **Discipline specific elective (ANY ONE)**			
a - **Theory**			
1.		--	--
2.			
b - **Practical**			
1.		--	--
2.			
C. GENERIC ELECTIVE (ANY ONE)			
a - **Theory**			
1.		-----	-----
b - **Practice**			
1.		-----	-----
D. Case studies		180	6
	Total	540	22

BASIC ELECTROCARDIOGRAPHY – I

a. Fundamental principles of electrocardiography
b. cardiac electrical field generation during activation Cardiac wave fronts Cardiac electrical field generation during ventricular recovery
c. Electrocardiographic lead systems. Standard limb leads Precordial leads and the Wisdom central termina Augmented limb leads
d. The hexaxial reference frame and electrical axis Recording adult and pediatric ECG
e. The normal electrocardiogram
f. Atrial activation The normal P wave
g. Artial repolarization
h. Atrioventricular node conduction and the PR segment Ventricular activation and the QRS complex Ventricular recovery and ST-T wave
i. U wave
j. Normal variants
k. Rate and rhythm

BASIC ECHOCARDIOGRAPHY – I

a. Basic introduction and posting in echo department Transthoracic echocardiography : Normal Dimension of cardiac chambers, views.

PHARMACOLOGY RELATED TO CARDIOLOGY

a. Anti-anginal agents
b. Anti-failure agents
c. Anti-hypertensive drugs
d. Anti- arrhythmic agents
e. Antithrombotic agents
f. Lipid lowering and anti-atherosclerotic drugs:
g. Miscellaneous drugs

CLINICAL CARDIOLOGY – I

- **a.** Pulse and its different types
- **b.** Recording of blood pressure
- **c.** General examination of cardiac patient
- **d.** Systemic examination of cardiovascular system
- **e.** Advanced ecg (tachy-arrthymia, brady-arrthymia)
- **f.** Symptomatology of heart failure
- **g.** Introduction to management of cardiac emergency
- **h.** Introduction Preventive Cardiology.

Fourth Semester

B.Sc. Cardiac Care course	**SEMESTER IV**		
Sr. Number	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a. Theory			
1) Paper I	**(Lectures ,Tutorials) TMT and 24 hrs Holter Monitoring - I**	30	2
2)Paper II	**(Lectures ,Tutorials) Medical Electronics and Biophysics**	30	2
3)Paper III	**(Lectures ,Tutorials) Electrocardiography - II**	30	2
4)Paper IV	**(Lectures ,Tutorials) Development of cardiovascular system**	30	2
b. Practical			
1)Paper I	**TMT and 24 hrs Holter Monitoring - I**	60	2
2)Paper II	**Medical Electronics and Biophysics**	60	2
3)Paper III	**Electrocardiography - II**	60	2
4)Paper IV	**Development of cardiovascular system**	60	2
B. **Discipline specific elective (ANY ONE)**			
a.- **Theory**			
1.	Bio-Medical Engineering	60	4
	Academic and research report writing		
b.- **Practical**			
1.	Bio-Medical Engineering	90	3
2.	Academic and research report writing		
C. GENERIC ELECTIVE (ANY ONE)			
a - **Theory**			
1.		-----	-----
b - **Practice**			
1.		-----	-----
D. Case studies		60	2
	Total	570	25

TMT AND 24 HRS HOLTER MONITORING – I

a. Exercise physiology
b. Exercise protocols
c. Lead systems
d. Patient preparation
e. ST segment displacement – types and measurement
f. Non-electrocardiographic observations
g. Exercise test indications, contra-indications and precautions
h. Cardiac arrhythmias and conduction disturbances during stress testing
i. Emergencies in the stress testing laboratory
j. Principles of Holter Recording
k. Connections of the Holter recorder
l. Holter Analysis
m. Guidelines for ambulatory electrocardiography

MEDICAL ELECTRONICS AND BIOPHYSICS

a. Introduction to medical physics
b. Blood pressure recording
c. Pressure transducers
d. Defibrillators
e. Pulse oximetry
f. Techniques of monitoring radiation exposure
g. Computer use in medical care & data entry

ELECTROCARDIOGRAPHY- II

a. The abnormal electrocardiogram
b. Left atrial abnormality
c. Right atrial abnormality
d. Left ventricular hypertrophy and enlargement
e. Right ventricular hypertrophy and enlargement
f. Intraventricular conduction delays
g. Left anterior fascicular block
h. Left posterior fascicular block
i. Left bundle branch block
j. Right bundle branch block
k. Myocardial ischemia and infarction
l. Repolarization (ST-Twave) abnormalities
m. QRS changes
n. Evolution of electrocardiographic changes
o. Localization of ischemia or infarction
p. Non-infarction Q waves
q. Primary and secondary T wave change
r. Electrolyte and metabolic ECG abnormalities
s. Cardiac arrhythmias
t. Ventricular premature beats
u. Supra-ventricular tachycardias
v. Atrial flutter/fibrillation
w. Ventricular Tachycardia/Ventricular fibrillation
x. Atrio Ventricular block
y. Prolonged PR interval
z. Mobitz type 1 and 2 block Complete heart block
aa. Direct Current (DC) shock
bb. Defibrillator
cc. Monophonic and biphasic shock
dd. Technique of cardio version
ee. Indications for cardio version

DEVELOPMENT OF CARDIOVASCULAR SYSTEM

a. EARLY DEVELOPMENT OF EMBRYO: Early development of embryo, Early blood vessel formation, Intra-embryonic blood vessel, Extra-embryonic blood vessel
b. DEVELOPMENT OF THE HEART: Formation and position of the heart tube, Formation and position of the heart loop, Mechanism of cardiac looping, Formation of the embryonic ventricle, Development of the sinus venosus, Formation of the cardiac septa, Atrial septation, The atrio-ventricular canal, The muscular interventricular septum, The septum in truncus arteriosus and the cordis conus
c. FORMATION OF THE CARDIAC VALVES: Formation of the cardiac valves, The atrioventricular valve, The semilunar valve.
d. FORMATION OF THE GREAT SYSTEMIC VEINS: The cardiac veins, The
e. vitelline veins, The umbilical veins, The vena cava
f. FETAL & NEONATAL CIRCULATION: Blood flow pattern, oxygenation &venous
g. return to the heart, Cardiac output and its distribution, Intra - cardiac vascular pressure,
h. Myocardial function & its energy metabolism
i. CHARACTERISTICS OF FETAL CIRCULATION AND CHANGES OCCUR
j. AT BIRTH: Postnatal circulation in detail
k. ETIOLOGY OF CARDIOVASCULAR MALFORMATION: Congenital anomalies in detail
l. ADULT CIRCULATION: Systemic Circulation, Pulmonary Circulation

Fifth Semester

B.Sc. Cardiac Care course	**SEMESTER V**		
Sr. Number	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a. Theory			
1) Paper I	**(Lectures ,Tutorials) Clinical Cardiology- II**	30	2
2)Paper II	**(Lectures ,Tutorials) TMT and 24 hrs Holter monitoring II**	30	2
3)Paper III	**(Lectures ,Tutorials) Cardiovascular diseases pertinent to cardiac care**	30	2
4)Paper IV	**(Lectures ,Tutorials) Cardiac Catheterization-I**	30	2
b. Practical			
1)Paper I	**Clinical Cardiology- II**	60	2
2)Paper II	**TMT and 24 hrs Holter monitoring - II**	60	2
3)Paper III	**Cardiovascular diseases pertinent to cardiac care**	60	2
4)Paper IV	**Cardiac Catheterization-I**	60	2
B. **Discipline specific elective (ANY ONE)**			
a - **Theory**			
1.			
2.			
b - **Practical**			
1.			
2.			
C. GENERIC ELECTIVE (ANY ONE)			
a - **Theory**			
1.		-----	-----
b - **Practice**			
1.		-----	-----
D Case studies		150	5
	Total	510	21

CLINICAL CARDIOLOGY- II

a. Echocardiography identification of Cardiac emergency
b. Assist in management of acute myocardial infarction
c. Assist in emergency coronary intervention
d. Assist in Assessment of patients with acute chest pain
e. Follow up assessment of heart failure clinic

TMT AND 24 HRS HOLTER MONITORING – II

a. Exercise physiology
b. Exercise protocols
c. Lead systems
d. Patient preparation
e. ST segment displacement – types and measurement
f. Non-electrocardiographic observations
g. Exercise test indications, contra-indications and precautions
h. Cardiac arrhythmias and conduction disturbances during stress testing
i. Emergencies in the stress testing laboratory
j. Principles of Holter Recording
k. Connections of the Holter recorder
l. Holter Analysis
m. Guidelines for ambulatory electrocardiography

CARDIOVASCULAR DISEASES PERTINENT TO CARDIAC CARE

a) Valvular heart disease

Etiology Acquired valvular heart disease
Rheumatic fever and rheumatic heart disease
Mitral valve disease, mitral stenosis, mitral regurgitation.
Aortic valve disease, aortic stenosis, aortic regurgitation
Tricuspid valve disease
Infective endocarditic Valvuloplasty and valve Surgery

b) Coronary artery disease

Pathophysiology and clinical Recognition
Angina Pectoris
Symptomatic and asymptomatic myocardial ischemia Types and locations of myocardial infarction
Thrombolytic therapy
Medical treatment Percutaneous interventions Surgical treatment

Cardiac rehabilitation

c) Systemic hypertension

Essential and secondary hypertension

d) Heart failure

Surgical and medical treatment

e) Myocardial diseases

Dilated Cardiomyopathy
Hypertrophic Cardiomyopathy
Restrictive Cardiomyopathy

Myocarditis

f) Pericardial Diseases

Pericardial Effusion
Constrictive pericarditis
Cardiac tamponade

CARDIAC CATHETERIZATION- I

a. Type of catheters
b. Catheter cleaning and packing
c. Techniques of sterilization-advantages and disadvantages of each
d. Setting up the cardiac catheterization laboratory for a diagnostic study
e. Table movement
f. Image intensifier movement
g. Image play back
h. Intra cardiac pressures
i. Pressure recording systems
j. Fluid filled catheters versus catheter tipped manometers
k. Artifacts, damping, ventricularization
l. Pressure gradient recording – pullback, peak – to peak
m. Cardiac output determination
n. Thermo dilution method
o. Oxygen dilution method
p. Principles of oximetry
q. Shunt detection and calculations.
r. Coronary angiography
s. Coronary angiographic catheters
t. Use of the manifold
u. Angiographic views in coronary angiography
v. Laboratory preparation for coronary angiography
w. Left Ventriculography – catheters, views, use of the injector
x. Right heart catheterization and angiography

Sixth Semester

B.Sc. Cardiac Care Course	SEMESTER VI		
Sr. No.	**Content**	**No. Hours**	**Credits**
A. CORE SUBJECT			
a. Theory			
1) Paper I	**(Lectures ,Tutorials)Echocardiography- II**	45	3
2)Paper II	**(Lectures ,Tutorials) Cardiac Catheterization- II**	45	3
3)Paper III	**(Lectures ,Tutorials) Cardiac Electro Physiology Intervention**	45	3
4)Paper IV	**(Lectures ,Tutorials) Pediatric Cardiology& Intervention**	45	3
b. Practical			
1)Paper I	**Echocardiography- II**	30	1
2)Paper II	**Cardiac Catheterization- II**	30	1
3)Paper III	**Cardiac Electro Physiology Intervention**	30	1
4)Paper IV	**PEDIATRIC CARDIOLOGY& INTERVENTION**	30	1
B. **Discipline specific elective (ANY ONE)**			
a - **Theory**			
1.	Basic of Clinical Skill learning	60	4
2.	Hospital operation management		
b.- **Practical**			
1.	Basic of Clinical Skill learning	120	4
2.	Hospital operation management		
C. GENERIC ELECTIVE (ANY ONE)			
a - **Theory**			
1.		-----	-----
b - **Practice**			
1.		-----	-----
D. Case studies		60	2
	Total	540	26

ECHOCARDIOGRAPHY – II

a. M- mode and 2D transthoracic echocardiography
b. Views used in transthoracic echocardiography
c. Doppler echocardiography: pulsed, continuous wave and colour
d. Measurement of cardiac dimendions
e. Evaluation of systolic and diastolic left ventricular function
f. Regional wall motion abnormalities
g. Stroke volume and cardiac output assessment
h. Transvalvular gradients
i. Orifice area
j. Continuity equation
k. Echocardiography in Valvular heart disease:
l. Mitral stenosis
m. Mitral regurgitation
n. Mitral valve prolapse
o. Aortic stenosis
p. Aortic regurgitation
q. Infective endocarditic
r. Prosthetic valve assessment
s. Echocardiography in Cardiomyopathies:
t. Dilated
u. Hypertrophic
v. Restrictive
w. Constrictive pericarditis
x. Pericardial effusion and cardiac tamponade
y. Echocardiographic detection of congenital heart disease:
z. Atrial septal defect
aa. Ventricular septal defect
bb. Patent ductus arteriosus
cc. Pulmonary stenosis
dd. Tetralogy of Fallot
ee. Coarctation of aorta
ff. Left atrial thrombus
gg. Left atroal myxoma
hh. Transo0esophageal echocardiography

CARDIAC CATHETERIZATION- II

1. Aortic angiography – aortic root, arch, abdominal aorta
2. Peripheral angiography and carbon dioxide angiography
3. Catheterization and angiography in children with congenital heart disease
4. Contrast agents
5. Ionic and non-ionic
6. Types of non-ionic agents
7. Contrast nephropathy
8. Measures to reduce incidence of contrast nephropathy
9. Coronary angioplasty (PTCA)
10. Equipment and hardware used in PTCA:
11. Guiding catheters
12. Guide wires
13. Balloons
14. Stents
15. Setting up the laboratory for a PTCA case
16. Management of complications:
17. Slow flow/no flow
18. Acute stent thrombosis
19. Dissection
20. Perforation
21. Pediatric Interventions
    a. Aortic and pulmonary valvuloplasty
    b. Coarcation angioplasty and Stenting
22. Device closure of PDA,ASD,VSD
23. Technique and devices used
24. Sizing of devices
25. Coil. Closure of PDAs
26. Balloon Mitral valvuloplasty (BMV)
27. Techniques and hardware used in BMV
28. Setting up the laboratory for a BMV case
29. Technique and equipment used for transseptal puncture
30. Recording of transmitral pressure gradients
31. Management of cardiac temponade
32. Peripheral intercentions
33. Equipment and techniques used
34. Endovascular exclusion of aneurysms
35. Self-expanding stents, covered stents and cutting balloons
36. Intra-aortic balloon pump (IABP)
37. Theory of intra-aortic balloon couonterpulsation
38. Indications for IABP use
39. Setting up the IABP system
40. Thromboembolic disease
41. Indications and use of venacaval filters
42. Techniques of thrombolysis – drug and catheters used
43. Thrombus aspirations systems – coronary, peripheral
44. Thrombus aspirations systems – coronary, peripheral
45. Cardiac pacing

46. Temporary pacing – indications, technique
47. Permanent pacing
48. Indications
49. Types of pacemakers and leads
50. Setting up the laboratory for permanent pacing
51. Pacemaker parameter checking
52. Follow-up of pacemaker patients
53. Cardiac electrophysiology
54. Catheters used in electrophysiology studies
55. Connection of catheters during an EP study
56. Equipment used in arrhythmia induction and mapping
57. Radiofrequency ablation
58. Image archival systems and compact disc (CD) writing
59. Text book recommended:
60. Cardiac Catheterization – Grossman

CARDIAC ELECTRO PHYSIOLOGY INTERVENTION

- **a.** Introduction to electrophysiological Study (EP Study)
- **b.** Indication of EP Study
- **c.** Introduction to hardwares used during EP Study
- **d.** Pre and Post operative care of EP patient
- **e.** Introduction to electrophysiological ablation (Simple arrthymia and complex arrthymia)
- **f.** Basic Introduction to 3D guided EP Study
- **g.** Introduction to ICD/CRT implantation procedures
- **h.** Indications, Temporary and Permanent Pacing

PEDIATRIC CARDIOLOGY& INTERVENTION

a. TOOLS TO DIAGNOSE CARDIAC CONDITIONS IN CHILDREN: History- General principles of the cardiovascular history, Chief complaint and/or presenting sign, Physical examination- Vital signs, Cardiac examination, Laboratory examinations
b. CARDIAC DEFECT CLOSURE DEVICE: Device closure procedures in Patent Foramen Ovale (PFO), Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD), Patent Ductus Arteriosus (PDA), Left Atrial Appendage (LAA)
c. PERCUTANEOUS VALVE COMMISSUROTOMY, REPAIR, AND REPLACEMENT: Cardiac Valves from the left to the right: Mitral, Aortic, Pulmonic & Tricuspid valves, their pathologies: MS, MR, AS, PS, TS and treatment.
d. PEDIATRIC INTERVENTIONAL CARDIOLOGY: Introduction, General Anesthesia Versus Sedation and Analgesia, Diagnostic procedures, Interventional Procedures, Device Placement.

EXAMINATION PATTERN

Internal assessment examination will be converted to of 20 marks theory and 20 marks practical and will be added in End semester examination.
End semester examination:
Question Paper Pattern:
Theory: 80 Marks
Answer all the questions.

I. Long Answers(Answer 2 out of 3) = 2 X 10 = 20
II. Short Answers (Answers 10 out of 12) =10 x 6 = 60

Total = 80 Marks
Practical:
Oral Examination: 20 Marks
Practical Examination 60 Marks
Total Marks : 80.
Total exam marks for end semester are 100 marks theory and 100 marks practical.

1. Promotion and award of grades

A student shall be declared PASS and eligible for getting he/she secures at least 50% marks in that particular course including internal assessment..

2. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified ,then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

3. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

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Grading of performances

Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in table I

Table –I Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average(SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$\mathbf{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * \text{ZERO} + C_5G_5}{\mathbf{C_1 + C_2 + C_3 + C_4 + C_5}}$$

Cumulative Grade Point Average(CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s),till the course(s) is/are passed. When the course(s)is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6 + C7S7 + C8S8}{\quad}$$

C1 + C2 + C3 + C4+ C5+ C6+ C7+ C8

where C_1, C_2, C_3,.... is the total number of credits for semester I,II,III,…. and S_1,S_2, S_3,....is the SGPA of semester I,II,III,…. .

19. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction= CGPA of. 7.50 and above

First Class= CGPA of 6.00 to7.49

Second Class= CGPA of 5.00 to5.99

20. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA.

21. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

Final Mark list Of University Examination

Sr. No.	Semester	Internal Assessment		End Semester Examination		Total	
		Theory 20 marks	Practical 20 marks	Theory 80 marks	Practical 80 marks	Theory 100 marks	Practical 100 marks
1	Semester I						
2	Semester II						
3	Semester III						
4	Semester IV						
5	Semester V						
6	Semester VI						