



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು  
**Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore**

4th T Block, Jayanagar, Bangalore – 560 041

AUTH/REV-MSC-ECHO/023/2015-16

12/08/2015

### NOTIFICATION

Sub: Ordinance relating to revised syllabus of **M.Sc. Echocardiography**.

Ref:1) Recommendations of Board of Studies in Allied Health Sciences,  
through its meeting dated 06.05.2015.

2) Approval of Academic Council through its meeting dated 28.05.2015

3) Approval of Syndicate in its 113<sup>th</sup> Meeting held on 26.06.2015

In exercise of the powers conferred by Section 35(2) of RGUHS Act 1994, the Syndicate in its 113<sup>th</sup> meeting held on 26/06/2015, is pleased to notify the Approval of ordinance relating to revised Syllabus of **M.Sc. Echocardiography** as shown in Annexure appended herewith.

The Ordinance shall come into force from the academic year 2015-16.

By Order,

(Dr.S.Sacchidanand)  
REGISTRAR

To:

**The Principals of colleges affiliated to RGUHS conducting M.Sc.Echocardiography course.**

Copy to:

1. The Principal Secretary to Governor, Governor's Secretariat, Raj Bhavan, Bangalore – 560 001.
2. Principal Secretary to Government, Health & Family Welfare Department, (Medical Education), Vikasa Soudha, Bangalore –560 001.
3. The Director, Department of Medical Education, Anand Rao Circle, Bangalore – 560 009.
4. PA to Vice-Chancellor / Registrar / Registrar (Eva.) / Finance Officer.
5. Director, Curriculum Development Cell.
6. The System Analyst, RGUHS to host it on RGUHS Website.
7. Guard File / Office Copy.

**Ordinance Governing  
M.Sc - ECHOCARDIOGRAPHY**

**Regulations and Curriculum  
2015**



**Rajiv Gandhi University of Health Sciences, Karnataka**  
4<sup>th</sup> 'T' Block, Jayanagar, Bangalore - 560 041

# Rajiv Gandhi University of Health Sciences, Karnataka,

## Bangalore

### THE EMBLEM



The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depicts Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace, Love and Harmony. In Hindu Philosophy it depicts the Vanaspathi (also called as Oushadi) held in the hands of Dhanvanthri, which are the source of all Medicines. The lamp at the bottom depicts human energy (kundalini). The script “Devahitham Yadayahu” inside the lamp is taken from Upanishath Shanthi Manthram (Bhadram Karnebhi Shrunuyanadev...), which says “**May we live the full span of our lives allotted by God in perfect health**” which is the motto of the Rajiv Gandhi University of Health Sciences.

## **Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore**

### **Vision Statement**

The Rajiv Gandhi University of Health Sciences, Karnataka, aims at bringing about a confluence of both Eastern and Western Health Sciences to enable the humankind “Live the full span of our lives allotted by God in Perfect Health”

It would strive for achievement of academic excellence by Educating and Training Health Professionals who

- Shall recognize health needs of community,
- Carry out professional obligations Ethically and Equitably and in keeping with National Health Policy,

It would promote development of scientific temper and Health Sciences Research.

It would encourage inculcation of Social Accountability amongst students, teachers and Institutions.

It would Support Quality Assurance for all its educational programmes.

**Motto**  
**Right for Rightful Health Sciences Education**

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**SECTION-I**

## AIMS AND OBJECTIVES

### 1. Aims and Objectives:

The goals of postgraduate training in Echocardiography is to train graduates who will:

- Practice the art and science of echocardiography efficiently and effectively, backed by scientific knowledge and skill.
- Exercise empathy and a caring attitude and maintain high ethical standards.
- Continue to evince keen interest in continuing professional development whether in teaching or practice.
- Willing to share the knowledge and skills with any learner, junior or a colleague.
- To develop faculty for critical analysis and evaluation of various concepts and views & to adopt most rational approach
- Demonstrate understanding of basic sciences relevant to respective branches.
- Acquire the detailed knowledge about the fundamentals and advances of the respective branches.
- Update knowledge by self-study and by attending courses, conferences and seminars relevant to branch chosen.
- Undertake audit; use information and carryout research with the aim of publishing or presenting the work at various scientific gatherings.

Acquire adequate skills and competence in performing various tasks as required.

- Adopt ethical principles in all aspects of the professional practice.
- Foster professional honesty and integrity.
- Discharge the duties irrespective of social status, caste, creed or religion of the customer/client.
- Develop oral and written communication skills.
- Provide leadership and get the best out of his or her team in a congenial working atmosphere.
- Apply high moral and ethical standards while carrying out research.
- Be humble and accept the limitations in his or her knowledge and skill and ask for help from colleagues when needed.

## SECTION-II

### Regulations Governing M.Sc. Echocardiography

#### 1. Title of the Courses

- Master of Science degree in Echocardiography (M.Sc – Echocardiography)

#### 2. Duration of the Course

The duration of the course shall be on full time basis 2 –Years

#### 3. Eligibility for Admission

Health science non-medical graduates: a pass in

- B.Sc Cardiac Care Technology having passes with 50% from a recognized institute and by RGUHS or from any other university established under the law considered equivalent thereto by RGUHS.

#### 4. Eligibility certificate

- No candidate shall be admitted for the postgraduate degree course unless the candidate has obtained and produced the eligibility certificate issued by the university. The candidate has to make the application to the university with the following documents along with the prescribed fee.
- Pass / degree certificate issued by the university.
- Marks cards of all the university examinations passed.
- Migration certificate.
- Certificate of conduct
- Proof of SC/ST or category-I as the case may be
- Candidates should obtain the eligibility certificate before the last date for admission as notified by the university.

**5. Medium of instruction.**

English shall be the medium of instruction for the subjects of study as well as for the Examination.

**6. Course of study**

The course shall be pursued on full time basis. No candidate shall be permitted to work in a health care facility or a related organization or laboratory or any other organizations outside the institution while studying the course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of study.

**7. SCHEME OF TEACHING AND EXAMINATION**

**1<sup>st</sup> Year**

Name of the Subject	No. of hours / week	EXAMINATION SCHEME				
	Lecture / Practical	Theory Exam (marks)	Duration of theory exam in Hours	Practical Marks	Viva (Marks)	Total
CLINICAL CARDIOLOGY	04	100	03	60	40	200
PHYSICS AND INSTRUMENTATION, EQUIPMENT, APPLICATIONS AND ERROR ANALYSIS (Clubbed II year portions into I year)	04	100	03	60	40	200
ECHOCARDIOGRAPHY FOR CORONARY ARTERY DISEASE	09	100	03	60	40	200
ECHOCARDIOGRAPHY FOR VALVULAR HEART DISEASE	09	100	03	60	40	200



ECHOCARDIOGRAPHY IN MYO- PERICARDIAL, AORTIC, SYSTEMIC DISORDERS & CARDIAC MASSES	09	100	03	60	40	200
<b>TOTAL</b>	<b>35</b>	<b>500</b>	<b>15</b>	<b>300</b>	<b>200</b>	<b>1000</b>

**SCHEME OF TEACHING AND EXAMINATION**

**2<sup>nd</sup> Year**

Name of the Subject	No. of hours / week	EXAMINATION SCHEME				
	Lecture / Practical	Theory Exam (marks)	Duration of theory exam in Hours	Practical/ Field Work / Assignment (marks)	Viva (Marks )	Total
CONGENITAL ECHOCARDIOGRAPHY - ACYANOTIC DISEASES	08	100	03	60	40	200
CONGENITAL ECHOCARDIOGRAPHY -CYANOTIC DISEASES	08	100	03	60	40	200
CARDIAC SURGERY	08	100	03	60	40	200
USE OF ULTRASOUND FOR NON CARDIAC DIAGNOSIS	08	100	03	60	40	200
DISSERTATION				60	40	100
<b>TOTAL</b>	<b>32</b>	<b>400</b>	<b>12</b>	<b>300</b>	<b>200</b>	<b>900</b>

**7. Attendance**

Every candidate should have attended at least 90% of the total number of academic 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 in their first attempt. A candidate lacking the prescribed percentage of attendance in any subject either in Theory or Practical in the first appearance will not be eligible to appear for the University Examination in that particular subject.

#### **8. Monitoring Progress of Studies**

**Log Book:** Every candidate shall attend symposia, seminars, conferences, journal review meetings & lectures during each semester as prescribed by the department and not absent him/her from work without valid reasons. Every candidate shall maintain a log book and record of his/her participation in the training programme. (Refer section III for model check lists and record book). Special mention may be made of the presentations by the candidate as well as details of laboratory work conducted by the candidate. The log book and record shall be scrutinized and certified by the concerned faculty members.

**Internal Assessment (IA):** 3 tests per year

**NOTE:** A student must secure at least 50% of total marks fixed for internal assessment for a particular subject in order to be eligible to appear in university examination in that subject. The internal assessment marks **will not be added** to the marks obtained in the university examination for declaration of pass.

#### **10. Dissertation**

Each candidate pursuing M.Sc. Echocardiography course is required to carry out dissertation work on a selected topic under the guidance of a recognized post graduate teacher for a period of one year after the submission of synopsis. The results of such a work shall be submitted in the form of dissertation.

The dissertation is aimed to train in research methods and techniques. It includes identification of problem, formulation of hypothesis, search and review of literature, getting acquainted with recent advances, collection of data, critical analysis, interpretation of results and drawing conclusions.

Every candidate shall submit to the RGUHS in the prescribed proforma, two hard copies of synopsis along containing particulars of proposed dissertation work within six months from the

date of commencement of the course or on or before the date notified by the University. The synopsis shall be sent through proper channel.

The University shall arrange for review of synopsis and if found suitable shall register the dissertation topic. No change in the dissertation topic shall or guide shall be made without prior approval of the University.

The dissertation shall be written under the following headings:

- Introduction
- Aims or objectives of study
- Review of literature
- Materials and methods
- Results
- Discussion
- Conclusion
- Summary
- References
- Tables
- Annexure

The written text of dissertation shall not be less than 50 pages and shall not exceed 100 pages excluding references, tables, questionnaires and other annexure. It should be neatly typed in double line spacing on one side of paper (A4 size, 8.27” x 11.69”) and bound properly. Spiral binding should not to be done. A declaration by the candidate that the work was done by him/her shall be included. The guide, head of the department and head of the institution shall certify the bonafide of the dissertation.

Four copies of dissertation shall be submitted to the university through proper channel along with a soft copy (CD), three months before the final examinations. It shall be assessed by two examiners appointed by the university, one internal and one external. Acceptance of the dissertation is a pre-requisite for a candidate to be eligible to appear in the final examination.

## 11. Guide

The eligibility academic qualification and teaching experience required for recognition as Guides by the RGUHS are:

### a). Eligibility to be a guide

Shall be a full time teacher or a consultant in the college or institution he or she is working.

### b) Academic qualification and teaching/professional experience for each branch

- DM / DNB in Cardiology with minimum of three years of teaching / professional experience.

Or

- M.Sc in Echocardiography with minimum of five years of teaching / professional experience.

### c) Age:

- The age of guide shall not exceed 65 years.

**d) Student: Guide ratio – 1:5** A recognized guide shall supervise dissertation work of not more than five students per academic year.

## 12. Schedule of examination

- The University conducts two examinations in a year at an interval not less than four to six months.
- The number of examiners for practical and viva-voce shall be two, comprising of one internal and one external examiner appointed by the university.
- A candidate shall not be admitted to the practical examinations for the first time unless he/she produces the class record book certified by the Head of the Department.
- A failed candidate needs to appear for both theory and practical examination in the failed subject/s only in the subsequent examination.

## 13. Scheme of examination:

### University examination:

2 examinations will be conducted: one at the end of 1<sup>st</sup> year and 2<sup>nd</sup> at the end of 2<sup>nd</sup> year.

### ➤ Written examination:

- 1<sup>st</sup> year: 5 papers of three hours duration each, each paper consists of 100 marks.
- 2<sup>nd</sup> year: 4 papers of three hours duration each, each paper consists of 100 marks

- **Practical examination:** Two practical examinations one at the end of 1<sup>st</sup> and the other at the end of 2<sup>nd</sup> year. Each practical examination carries 75 marks.
- **Viva- voce:** - This shall aim at assessing depth of knowledge, logical reasoning, confidence and oral communication skills. Both internal and external examiners shall conduct the viva- voce. Total marks shall be 25.

## SCHEME OF EXAMINATION

### THEORY EXAMINATION

There shall be one paper in each subject of 3-hour duration, carrying 100 marks.

Duration : 3 hours  
Max. Marks : 100

#### Distribution of marks

Type of questions	No of questions for each subject	No. of questions and marks for each question	Total marks
Long essay	2	2 x 15	30
Short essay	8	7 x 10	70

Each subject has 6 – 8 modules and at least one question from each module has to be asked.

### PRACTICAL EXAMINATION

Duration : 3 hours  
Max. Marks : 100

#### Marks

- A). PRACTICAL -60
1. Spotters: Echo, ECG, CXR, Clinical case summary- diagnostic interpretation - 20
  2. Practical echo case demonstration - 40
- B. VIVA- VOCE - 40

The Viva-voce exam will be conducted by both the internal and external examiners.

## **Criteria for Pass.**

### **a. Criteria for pass in a subject:**

For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical examination components separately, as stipulated below: Theory component consists of marks obtained in University Written paper. For a pass in a theory subject, a candidate shall secure not less than 50% of maximum marks in each paper and an aggregate of 50% marks per subject prescribed for the University examination separately. For pass in practical examination the candidate has to secure 50% marks in aggregate i.e. marks obtained in the practical and viva-voce examination added together provided the candidate has secured 40% marks in practical examination.. A failed candidate is required to appear for both Theory and Practical in the subsequent examination in that subject. .

### **b. Criteria for pass:**

#### **In First and Second year**

To consider as pass in first / second year, a candidate has to appear in all the papers prescribed for each subject and has to pass in all the prescribed subjects of the University examination for the concerned year.

## **15. Carry over**

A candidate who has appeared in all subjects of first year in the university examination is eligible to go to second year provided he/she has passed in any three subjects. However, failed candidate has to pass the failed subject to become eligible to appear for second year university examination.

**16. Number of attempts**

A candidate is permitted not more than **three** attempts (actual appearance) to pass the first year examination or **within two academic years** from the year of admission, whichever is earlier. A candidate will not be allowed to continue the course if he/she fails to comply with the above stipulation.

**17. Maximum duration for completion of course:** Four years**18. Eligibility for award of degree**

A candidate shall have passed in all the subjects of first and second years.

**1<sup>st</sup> Year**  
**M. Sc –Echocardiography**  
**CLINICAL CARDIOLOGY**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **The Electrical Activity of the Heart: the Electrocardiogram:** The cardiac action potential, the electrocardiogram. **Disorders of Rate, Rhythm and Conduction:** Mechanisms of arrhythmias, disturbances of rate and rhythm, disorders of conduction, investigation of arrhythmias, management of arrhythmias.
2. **Radiology of the chest:** objectives, introduction, radiologic anatomy, cardiothoracic ratio, chamber & vessel enlargement, pulmonary vasculature, cardiac calcification, special situations.
3. **Other cardiac investigations- TEE, Saline contrast echo, intracardiac echo, epiaortic echo, epicardial echo,** cardiac CT-Basics, Cardiac MRI-Basics, PET & Nuclear studies in cardiology, Angiogram and related uses, PCI
4. Elaborate knowledge of the heart sounds and murmurs, systolic and diastolic time intervals.
5. **Diseases of the Coronary Arteries:** Causes, Pathology and Prevention, Coronary Heart Disease – Angina and Unstable Angina; Coronary Heart Disease – Myocardial Infarction: Treatment of acute infarction, complications of acute myocardial infarction and their management, late complications of infarction, risk stratification at hospital discharge, drug treatment at discharge, rehabilitation.
6. **Rheumatic Fever and its Sequelae, Disorders of the Cardiac Valves:** Mitral valve disease, aortic valve disease, tricuspid valve disease, pulmonary valve disease, infective endocarditis.
7. **Heart Failure:** The Pathophysiology of heart failure, clinical syndromes of heart failure, the management of cardiac failure, acute circulatory failure (shock), cardiac transplantation..
8. **Congenital Heart Disease:** The varieties of congenital heart disease.

**Textbook:**

- Cardiology, 7<sup>th</sup> Edition, Desmond G. Julian, J. Campbell Cowan, James M. Mc Lenachan

**PRACTICALS**

Clinical scenario given to the candidate for diagnosis and treatment of following disorders:

- a. Unstable angina
- b. Myocardial infarction



- c. Left ventricular aneurysm
- d. Congestive heart failure
- e. Cardiac arrhythmia
- f. Atrial septal defect
- g. Ventricular septal defect
- h.** Tetralogy of Fallot
- i.** Hypertension
- j.** Valvular heart disease

**1<sup>st</sup> Year**  
**M. Sc – Echocardiography**  
**PHYSICS AND INSTRUMENTATION, EQUIPMENT, APPLICATIONS**  
**AND ERROR ANALYSIS**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Physical Properties of Ultrasound:**, Acoustic impedances of media, specular and scattered echoes, resolving power of ultrasound, attenuation, acoustic shadowing.
2. **Transducers and the Production of Ultrasound Beams:** Piezoelectric crystals, transducer design, side-lobes, phased array transducers, Fresnel and Fraunhofer's zones, manipulating the ultrasound beam, focal zones, linear and Azimuthal beams, manipulating the ultrasound beam, gain settings.
3. **Principles of M-mode and Two Dimensional Echocardiography:** Variables in Real-time Sector Scanning: Signal processing, echocardiographic image controls, factors influencing resolution, artifacts- reverberations, near-field clutter, depth control, dynamic range, echocardiographic imaging controls, factors influencing resolution.
4. **Principles of Doppler Echocardiography:** Doppler shift and its medical applications, angle corrections, Pulse and continuous wave Doppler, Nyquist limit, aliasing Doppler display, technical limitations of Doppler flow imaging. **Colour Flow Imaging:** based on Doppler principles, manipulating sector, colour gains and colour maps, assessing severity of regurgitations, limitations of colour flow, 'billiard ball effect', Proximal Isovelocity Surface Area (PISA).
5. **Specialized Techniques in Echocardiography- Technical Aspects:** Tissue Doppler imaging, TEE probes, contrast studies-intracavitary and myocardial, cardiac dysynchrony, intravascular transducers digital echocardiography, computer manipulations of echo recordings, tissue identification using ultrasound, three dimensional echocardiography.
6. **Biological Effects of Ultrasound:** Acoustic energy-power density, duty factor, Spatial and temporal average and peak intensity, cavitation- especially in regard to newer contrast agents, heat production- especially transoesophageal intraop studies, oscillatory and sheer forces, micro streaming-genetic concerns.
7. **Equipment maintenance and design:** Understanding how echo machines and probes are designed, their maintenance and upkeep, adjustments of various parameters in routine and special studies, components of the echo machine, types of probes and their design, protocols for maintenance and upkeep of the equipment. **Understanding applications:** Gain settings, depth, angle corrections, scale and sweep, colour and gray scale maps and so on.

8. **Error analysis:** Error free performance of large number of studies in the shortest possible time, quality control, elicitation and presentation of clinically relevant data. Sources of error and inter-observer variations with specific reference to left-ventricular function, left ventricular thrombi, mitral and aortic regurgitation and its quantitation.
9. Newer types of ultrasound scanners: portable, laptop, handheld, palm held, point of care echo's
10. **Equipment break-down-electrical aspects:** Circuitry and detection of electrical malfunction. **Equipment break-down-software:** Software, generation of the echo image, common sources of breakdown and how they are to be addressed
11. **Storage and retrieval of echo images:** Generating images of diagnostic quality, capture of loops so as to minimize space, post-study processing, storage and retrieval of images, reporting from a central monitor.

**Textbooks:**

1. Echocardiography by Feigenbaum – 6<sup>th</sup> Edition
2. Principle of Medical Imaging by Kirk Shung
3. Handbook of Biomedical Instrumentation by R.S. Khandpur, 2<sup>nd</sup> Edition

**PRACTICALS**

Applications of principles to obtaining, storing and retrieving optimal images:

- Transducer selection
- Gain and depth controls
- Use of M-mode for temporal analysis of cardiac events and obtaining measurements
- Use of modalities to optimize colour flow such as colour maps, gain and scale
- Adjustments related to doppler such as scale, PRF, sweep, angle correction
- Use of specialized techniques such as Tissue Doppler
- Candidates will accompany biomedical and service engineers during preventive maintenance visits to understand aspects of equipment design
- Candidate will be allocated equipment for maintenance
- Candidate will be required to perform rapid studies during OP peak hours under supervision and will participate in subsequent debriefing
- Will assist consultant in quality control exercise on a weekly basis
- Candidate would be required to store and retrieve studies of diagnostic quality- clinician satisfaction will be taken as a yardstick for performance

**1<sup>st</sup> Year**  
**M. Sc – Echocardiography**  
**ECHOCARDIOGRAPHY FOR CORONARY ARTERY DISEASE**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Understanding coronary circulation:** Coronary anatomy and physiology, pathogenesis of atherosclerotic plaques, abnormalities of coronary perfusion, wall thickening
2. **Wall motion segmentation, analysis and scoring:** Segmental analysis for wall motion defects, coronary artery territories, detection and quantitation of Ischaemic muscle-wall motion scoring, **Ischemic Cardiomyopathy**
3. **Myocardial infarction:** Detecting and assessing MI, co-relation with coronary anatomy, prognostication following MI. **Complications of MI:** Aneurysm, pseudoaneurysm, Ventricular Septal Defect, thrombi-embolic potential, right ventricular involvement
4. **Stress echocardiography:** Protocols for stress echocardiography, detection of reversible Ischaemic, detecting inducible ischaemia/viability, specificity and sensitivity
5. **Newer echo techniques and their application in CAD:** Tissue Doppler, Speckle echo & Contrast echo - indications , contraindications, drug dosage, delivery of contrast, interpretation with study of myocardial perfusion and LV opacification
6. **Role of CT angio, MRI and nuclear perfusion & myocardial viability in CAD**
7. Pre and postoperative evaluation of CAD: Coronary Artery Bypass Grafting (CABG), Linear endo-ventricular patchplasty (Dorr's procedure), post VSR, ischemic mitral regurgitation, coronary anomalies-echocardiographic aspects, LVAD: indications, technique and post-op evaluation

**Textbooks and Reference Books:**

1. Echocardiography by Feigenbaum (Latest Edition)
2. Echo manuals by Mayo Clinic Lecture notes.
3. Text book of clinical Echocardiography, Catherine M. Otto, (Hardcover International)
4. Cardiology by Braunwald and Hurst (Latest edition)

## **PRACTICALS**

### **ECHOCARDIOGRAPHY FOR CORONARY ARTERY DISEASE**

1. Linear measurements: indirect M-Mode markers of left ventricular function.
2. Assessing global LV function.
3. Regional left ventricular function: wall motion scoring, relationship to vascular supply, use of tissue Doppler where indicated.
4. Evaluation of diastolic function: Methods for evaluating diastolic function, Doppler evaluation of diastolic function, Evaluation of mitral inflow, determination of isovolumic relaxation time, Evaluation of pulmonary vein flow, Doppler tissue imaging.
5. Complications of IHD such as aneurysms, VSD, clots & MR especially from a surgical perspective.

Candidate would be allocated 1-2 cases-15-20 minutes would be allocated for each case. 20% of marks would be for formulating the diagnostic question 30% for performance and patient handling, 20% for interpretation and 20% for discussion.

**1<sup>st</sup> Year**  
**M. Sc – Echocardiography**  
**ECHOCARDIOGRAPHY FOR VALVULAR HEART DISEASE**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Haemodynamic information derived from echocardiography:** Normal intracardiac pressures, Aortic flow, pulmonary flow, mitral flow, left atrial flow, tricuspid valve flow, cardiac output, regurgitant fraction shunt ratios, echocardiographic detection of stagnant blood flow, modified Bernoulli equation and intravascular pressures, echocardiographic findings with elevated left ventricular diastolic pressure, elevated left atrial pressures, pulmonary hypertension, right ventricular pressure, right atrial pressure.
2. **Mitral stenosis:** Etiopathogenesis, pathophysiology and haemodynamics, diagnosis, assessing severity, secondary effects, assessment for balloon mitral valvotomy-transesophageal echocardiography and its uses, post-procedural assessment, open mitral valvotomy versus mitral valve replacement- pre and post-operative assessment.
3. **Mitral regurgitation:** Mitral valve prolapse and analysis of segments, Haemodynamics of MR, diagnosis of MR, assessing severity and secondary effects, pre-op, intra-op and post-operative, assessment for mitral valve repair, use of three dimensional echocardiography for mitral valve surgery, flail mitral valve, papillary muscle dysfunction. mitral annular calcium.
4. **Aortic stenosis:** Etiopathogenesis and haemodynamics, sub-valvar, valvar and supra-valvar lesions, cuspal morphology, diagnosis and assessment of secondary effects, time course and prognostication, pre-operative and post-operative assessment
5. **Aortic regurgitation:** Etiopathogenesis and haemodynamics, diagnosis, assessing severity, secondary effects, relevant aspects of left ventricular function, timing of surgery, pre-operative and post-operative assessment.
6. **Tricuspid valve disease:** Anatomy and physiology of the healthy valve, structural and functional changes in various disease states organic and functional involvement, tricuspid stenosis, tricuspid regurgitation and assessment of severity, approach to pulmonary artery hypertension.
7. **Pulmonary valve disease:** Embryology, morphology, infundibular, valvar, supra valvar and peripheral pulmonic stenosis, assessing severity of pulmonic stenosis, pre and post procedural assessment for pulmonary valvuloplasty, pulmonary regurgitation.

8. **Prosthetic valves:** Types and normal function of mechanical valves, stenosis regurgitation, use of transesophageal echo for prosthetic valves, endocarditis: and its sequelae in native and prosthetic heart valves.
9. **Stress echo in valvular Heart Disease.**
10. **TAVI & Mitral valve repair** – indications, contraindications, pre and post procedure evaluation
11. Role of 3D echo in Valvular Heart Diseases

**Textbooks and Reference Books:**

1. Echocardiography by Feigenbaum (Latest Edition)
2. Echo manuals by Mayo Clinic Lecture notes.
3. Journal articles Cardiology by Braunwald and Hurst (Latest edition)
4. Text book of clinical Echocardiography, Catherine M. Otto, (Hardcover International)

**PRACTICALS**

**ECHOCARDIOGRAPHY FOR VALVULAR HEART DISEASE**

1. Aortic valve disease: Aortic stenosis- Diagnosis, assessing mechanism and severity, assessing site, possible etiology, secondary effects such as LV function, impact on associated lesions and therapeutic approach
2. Aortic regurgitation: establishing a diagnosis, evaluating the severity of aortic, regurgitation, acute versus chronic aortic, regurgitation, assessing the left ventricle.
3. Mitral valve disease: Mitral stenosis – two-dimensional echocardiography in rheumatic mitral stenosis, congenital mitral stenosis, M-model Echocardiographic appearance, transoesophageal echocardiography, three dimensional of severity, anatomic determination of severity, exercise gradients, secondary features of mitral stenosis, Atrial fibrillation, secondary pulmonary hypertension, decision making regarding intervention.
4. Mitral regurgitation: Doppler evaluation of mitral regurgitation, determination of mitral regurgitation, severity, other considerations in assessing mitral regurgitation.
5. Tricuspid and pulmonary valves: Pulmonary valve: Pulmonary valve stenosis, pulmonary valve regurgitation, evaluation of the right ventricular outflow tract, miscellaneous abnormalities of the pulmonary valve.

Candidate would be allocated 1-2 cases-15-20 minutes would be allocated for each case. 20% of marks would be for formulating the diagnostic question. 30% for performance and patient handling, 20% for interpretation and 20% for discussion.

**1<sup>st</sup> Year: M. Sc – Echocardiography**  
**ECHOCARDIOGRAPHY IN MYO-PERICARDIAL,**  
**AORTIC, SYSTEMIC DISORDERS & CARDIAC MASSES**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Hypertrophic Cardiomyopathy:** Morphological variants, diagnosis, hemodynamics, assessing intracavitary and outflow tract gradients, evaluation of therapy, pre and post-procedural evaluation.
2. **Idiopathic dilated cardiomyopathy:** Diagnosis and differentiation from other disorders such as IHD, ventricular functions and secondary effects, pre and post-procedural evaluation for cardiac re-synchronization therapy. Overview of cardiac transplantation
3. **Restrictive Cardiomyopathy:** Diagnosis and haemodynamics, infiltrative cardiomyopathies, miscellaneous- myocardial diseases in neuromuscular disorders, infectious agents and toxins.
4. **Diseases of the pericardium:** Pericardial effusion: Detection of fluid, diagnosis-pleural versus pericardial fluid, quantitation, loculated effusions, cardiac tamponade-diagnosis, haemodynamics etiology, pericardiocentesis Constrictive pericarditis: Diagnosis and haemodynamics. Differentiation from restrictive Cardiomyopathy, pre and post-surgical evaluation. Miscellaneous: acute pericarditis, pericardial thickening, pericardial cysts, absent pericardium.
5. **Diseases of the aorta:** Aortic dilatation and aneurysms, Aortic dissection-diagnosis and classification, false aneurysms, aneurysms of the aortic sinuses- rupture, haemodynamics, pre-and post surgical evaluation. Miscellaneous-trauma, infections, aorta-left-ventricular tunnel, atherosclerosis, Role of transesophageal echocardiography.
6. **Echocardiography in systemic disorders:** Diabetes hypertension, renal failure, neurological conditions, collagen vascular diseases and so on.
7. **Cardiac masses:** Normal variants, primary cardiac neoplasms and secondaries involving the heart, secondary effects, extra cardiac masses, intra cardiac thrombi, ultrasonic typing, man-made objects in the heart
8. Electrophysiology: echo in bundle branch blocks and Wolf-Parkinson-White syndrome, Atrial fibrillation, ectopic rhythm-ventricular and supra-ventricular, pacemakers, CRT & ICD
9. **Use of TEE in intensive care setup & role of 3-D echo in above conditions**



**Textbooks and Reference Books:**

1. Echocardiography by Feigenbaum (Latest Edition)
2. Echo manuals by Mayo Clinic Lecture notes.
3. Journal articles Cardiology by Braunwald and Hurst (Latest edition)

**PRACTICALS**

**ECHOCARDIOGRAPHY IN MYOCARDIAL, PERICARDIAL,  
AORTIC AND SYSTEMIC DISORDERS**

1. Cardiomyopathies: Dilated cardiomyopathy, Doppler evaluation of systolic and diastolic function, secondary findings in dilated cardiomyopathy, etiology of dilated cardiomyopathy, determination of prognosis in dilated cardiomyopathy.
2. Hypertrophic cardiomyopathy: echocardiography evaluation of hypertrophic cardiomyopathy, assessment of the left ventricular outflow tract in obstructive cardiomyopathy, Mitral regurgitation in hypertrophic cardiomyopathy, other variants hypertrophic cardiomyopathy, mid-cavitary obstruction, conditions mimicking hypertrophic cardiomyopathy, therapeutic decision making and monitoring in hypertrophic cardiomyopathy.
3. Disease of the aorta: echocardiographic evaluation, aortic dilation and aneurysm, marfan syndrome, Valsalva sinus aneurysm, aortic dissection, aortic atheroma.
4. Masses, tumors and source of embolus: Normal variants and artifacts, cardiac tumors; primary tumors, metastatic tumors of the heart
5. Intra-cardiac thrombi: left ventricular thrombi, left atrial thrombi, right atrial thrombi, spontaneous echo contrast.

**1<sup>st</sup> Year**  
**M. Sc – Echocardiography**  
**SUBSIDIARY SUBJECTS**

Hours per week : 04  
Total Hrs : 20

Total Marks: 75

- 1. Communication & interaction with patients and hospital staff**
- 2. Intensive care setup, protocols to follow in emergency situations & CPR, IV line insertion**
- 3. Administrative issues – maintenance of quality & standards in hospitals, record maintenance, stocks & purchase, medico legal issues**
- 4. How to prepare a report in various procedure - Routine trans-thoracic echo: adult and congenital/pediatric, TEE, contrast echo, vascular study & advanced echo**
- 5. Archiving of clinical data and images & research: Basics**
- 6. Work related injuries in echo – Types of injuries, prevention, management**

**2<sup>nd</sup> Year**  
**M. Sc – Echocardiography**  
**CONGENITAL ECHOCARDIOGRAPHY- ACYANOTIC DISEASES**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 32	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Approach to the paediatric echocardiography:** Special needs of paediatric patients, segmental analysis- approach to congenital heart disease.
2. **Congenital asyanotic Heart Diseases :**
  - a. Septation defects, Outflow lesions, Valular lesions(Obstructive, Regurgitant)
  - b. Conditions with increased and decreased PA flow.
  - c. Univentricular Heart and all anomalies with single ventricular physiology
3. **Classification of congenital heart disease:** Congenital heart diseases detected for the first time in adulthood
4. **Administering sedation-**monitoring and possible complications
5. **Atrial septal defect:** Development of the interatrial septum, haemodynamics, site, size of defect, magnitude of the shunt, assessing for feasibility of device closure versus surgery, trans esophageal echocardiography in ASD, assessing pulmonary circulation, associated malformations.
6. **Ventricular septal defect:** Development of the interventricular septum, haemodynamics, site, size of defect, magnitude of the shunt assessing pulmonary arterial hypertension, pre-op and postoperative assessment, secondary effects, assessing pulmonary circulation, Eisenmenger's syndrome associated malformations.
7. **Role of 3D echo in pediatric echocardiography**

**Textbooks and Reference Books:**

1. Paediatric Echocardiography by Rebecca Snyder (Latest edition)
2. Congenital heart disease by Perloff.

**PRACTICALS**

**PAEDIATRIC ECHOCARDIOGRAPHY**

1. Abnormalities of right ventricular inflow
2. Abnormalities of left ventricular inflow: Pulmonary veins, left atrium, and mitral valve.
3. Abnormalities of right ventricular outflow: Right ventricle, pulmonary valve, pulmonary artery

4. Abnormalities of left ventricular inflow: subvalvular obstruction, Valvular aortic stenosis, supra-ventricular aortic stenosis.
5. Coarctation of the aorta
6. Abnormalities of cardiac septation: Atrial septal defect, ventricular septal defect, endocardial cushion defect.

Candidate would be allocated 1-2 cases-15-20 minutes would be allocated for each case. 20% of marks would be for formulating the diagnostic question; 30% for performance and patient handling, 20% for interpretation and 20% for discussion.

**2<sup>nd</sup> Year**  
**M. Sc – Echocardiography**  
**CONGENITAL ECHOCARDIOGRAPHY- CYANOTIC DISEASES**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 32	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

- 1. Atrio-ventricular septal defects:** Pertinent embryology, components, diagnosis, haemodynamics assessing pulmonary circulation, pre-surgical evaluation with particular reference to the atrio-ventricular valves. Post-operative evaluation.
- 2. Tetralogy of Fallot and Double outlet right ventricle:** Pertinent embryology, diagnosis, haemodynamics assessing pulmonary anatomy with a view to surgical planning, associated malformations, post-operative assessment, systemic-pulmonary shunts performed.
- 3. Transposition of the great arteries:** Pertinent embryology, diagnosis, associated malformations, pre and postoperative evaluation. Corrected Transposition of the great arteries: Pertinent embryology, diagnosis, associated malformations, approach to the adult patient with C-tga, indications for surgery.
- 4. Coarctation of the aorta, Patent ductus arteriosus:** Coarctation of the aorta- relevant embryology, haemodynamics, associated malformations, pre and postoperative evaluation. Brief overview of other aortic malformations. Patent ductus arteriosus: Fetal versus adult circulation, haemodynamics, magnitude of the shunt, pulmonary arterial hypertension Eisenmenger's syndrome, anatomical evaluation for feasibility of device closure.
- 5. Anomalous pulmonary venous connections:** Pertinent embryology, classification-site, total vs. partial, assessing newborn with suspected TAPVC, pre and post-operative evaluation. Other miscellaneous conditions such as truncus arteriosus and A-P window.
- 6. Perioperative Transoesophageal Echocardiography for congenital heart disease, TEE for cathlab procedures.**

## **PAEDIATRIC ECHOCARDIOGRAPHY**

1. Abnormalities of left ventricular inflow: subvalvular obstruction, Valvular aortic stenosis, supravalvular aortic stenosis.
2. Coarctation of the aorta
3. Abnormalities vascular connection and structures: patent ductus arteriosus, abnormal systemic venous connections, abnormal pulmonary venous connections, abnormalities of the coronary circulation.
4. Conotruncal abnormalities: Tetralogy of Fallot, transposition of the great arteries, double outlet right ventricle, persistent truncus arteriosus and aortopulmonary window.

Candidate would be allocated 1-2 cases-15-20 minutes would be allocated for each case. 20% of marks would be for formulating the diagnostic question; 30% for performance and patient handling, 20% for interpretation and 20% for discussion.

**2<sup>nd</sup> Year**  
**M. Sc – Echocardiography**  
**CARDIAC SURGERY**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Coronary Artery Disease:** Pathophysiology: Indications for CABG, Contraindication to CABG, Planning coronary artery surgery, Conduit, selection, Principles of saphenous vein harvest, Saphenous vein harvest, LIMA harvest, RIMA harvest, Alternative conduits, Distal anastomoses on bypass ,Jump or sequential grafts , Endarterectomy, Positioning the heart in OPCAB , Distal anastomoses to aorta , Proximal anastomoses to aorta, Redo coronary artery bypass surgery, Problem scenarios in redo surgery , Left ventricular aneurysm , LV aneurysmectomy ,Ischaemic ventriculoseptal defect (VSD), Ischaemic mitral regurgitation, Results of coronary artery bypass surgery.
2. **Valvular Heart Disease:** Pathophysiology of aortic stenosis, Pathophysiology of aortic regurgitation, Timing of surgery – aortic, Principles of aortic valve replacement, Aortic valve implantation, Stentless aortic valve replacement, Homograft aortic valve replacement, The Ross procedure, Aortic root replacement, Aortic root enlargement, Principles of valve sparing procedures, Results of aortic valve surgery, Pathophysiology of mitral stenosis, Pathophysiology of mitral regurgitation, Timing of surgery – mitral, Principles of mitral valve repair , Mitral Valvotomy, Principles of mitral valve repair, Mitral valve replacement , Tricuspid valve disease , Surgery for infective endocarditis, Combined Valvular procedures , Alternative approaches , Results of mitral and tricuspid valve surgery.
3. **Congenital heart disease:** Overview of congenital heart surgery, Patent ductus arteriosus, Anomalous pulmonary venous connection, Coarctation of the aorta, Atrial septal defects ,Ventricular septal defects , Atrioventricular septal defects, Truncus arteriosus, AV alignment abnormalities, Transposition of the arteries, Ebstein’s anomaly , Tetralogy of Fallot ,Hypoplastic left heart syndrome , Basic operative technique , Arterial switch (Jatene), Rastelli operation, Damus-kaye-stansel operation, Norwood operation, Glenn shunt and hemi – Fontan, Fontan operation , Pulmonary artery banding, Aortopulmonary shunts, Tetralogy of Fallot repair Pulmonary valvotomy, Aortopulmonary window repair, Coarctation of the aorta repair, Interrupted aortic arch repair, LVOT obstruction repair.
4. **Diseases of the thoracic aorta:** Pathology of aortic dissection, Diagnosis of type A aortic dissection, Management of type A dissections, Set – up for repair of aortic dissection, Repair of DeBakey type II dissection , Repair of DeBakey type I dissection, Management of type B dissections, Other repair techniques ,Pathology of aortic

aneurysms , Diagnosis of aortic aneurysms , Management of aortic aneurysms , Surgery for ascending aneurysms , Valve sparing surgery techniques, Surgery for aortic arch aneurysms, Repair of descending aortic aneurysms , Bypass for descending aorta surgery, Traumatic aortic transection

5. **Minimal access surgery:** Incisions, Options for Cardiopulmonary bypass, LIMA harvest, Coronary artery bypass grafting (CABG), Valve surgery.
6. **Complications of cardiac surgery:** Normal postoperative course, Overview of complications, Hypotension and tamponade, Chest pain and ischemia, Late arrhythmias, Hypertension, Pericardial problems, Complications of valve surgery, Respiratory complications, Renal Complications, Gastrointestinal symptoms, Gastrointestinal complications, Hepatobiliary complications, Stroke, Management of stroke, Neurological complications, Wound infections, wound complications, Haematological complications.
7. **Cardiac Anaesthesia:** Basic Principles of anaesthesia, Conduct of anaesthesia, Pre-bypass anaesthetic management, Anaesthetic management of bypass, Anaesthetic management post – bypass, Anaesthesia for off – pump surgery.

**Textbook:**

Oxford specialist handbook in surgery (Cardio thoracic surgery), Indian Edition, Joanna Chikwe, Emma Beddow, Brain Glenville.

**PRACTICALS**

**CARDIAC SURGERY**

Brief description of surgical steps involved in:

- a. Coronary artery bypass grafting (on pump CABG)
- b. Mitral valve replacement
- c. Aortic valve replacement
- d. ASD closure
- e. VSD closure
- f. TOF repair
- g. Redo sternotomy
- h. Off-pump CABG



**2<sup>nd</sup> Year**  
**M. Sc – Echocardiography**

**USE OF ULTRASOUND FOR NON CARDIAC DIAGNOSIS**

Hours per week	: 04	Viva Marks	: 40
Total Hrs	: 56	Practical exam marks	: 60
Exam Hours	: 03	Theory exam marks	: 100
		Total Marks	: 200

1. **Gynecological scanning:** infertility for ovulation induction, rule out pelvic mass, pelvic pain without positive pregnancy test, vaginal bleeding with negative pregnancy test, intra uterine contraceptive devices-lost IUD
2. **Abdominal ultrasound:** Sonographic abdominal cavity, Epigastric pain, pancreatic, right upper quadrant mass, possible metastasis of liver, right upper quadrant pain, abnormal liver function tests, fever of unknown origin(FUO); palpable left upper quadrant mass, pediatric mass, midabdominal mass.
3. **Renal ultrasound:** Renal failure, possible renal mass, hematuria
4. **Pelvic ultrasound:** Right lower quadrant pain.
5. **Chest ultrasound & soft tissue imaging of neck**
6. **Vascular Ultrasound:** Carotid Doppler, Arterial Doppler, Venous Doppler, Trans cranial Doppler - Indications

**Textbook:**

Clinical Sonography, A practical guide, 3<sup>rd</sup> edition, Ranger Sanders

**PRACTICALS**

**Practical aspects of**

- a. Vascular Ultrasound
  - b. Abdominal ultrasound
  - c. Renal ultrasound
  - d. Pelvic ultrasound
- i). demonstration of pelvic organs
  - ii. interpretation of stored pathological lesions
- i). demonstration of pelvic organs
  - ii. interpretation of stored pathological lesions

**2<sup>nd</sup> Year**  
**M. Sc – Echocardiography**

**DISSERTATION**

#### **SECTION-IV** **MONITORING LEARNING PROGRESS**

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Model Checklists are given in this Chapter, which may be copied and used.

The learning out comes to be assessed should include:

i) ***Acquisition of Knowledge:*** The methods used comprise of 'Log Book' which records participation in various teaching / learning activities by the students. The number of activities attended and the number in which presentations are made are to be recorded. The logbook should periodically be validated by the supervisors. Some of the activities are listed. The list is not complete. Institutions may include additional activities, if so, desired.

***Journal Review Meeting (Journal Club):*** The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist – I, Section IV)

***Seminars / Symposia:*** The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (see Model Checklist-II, Section IV)

ii) ***Teaching skills:*** Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist III, Section IV)

iii) **Dissertation:** Please see checklist IV and V in Section IV.

**iv) Log Book-** Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of experiments or laboratory procedures, if any conducted by the candidate.

**v) Records:** Records, log books and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University.

**Logbook:**

The logbook is a record of the important activities of the candidates during his training; Internal assessment should be based on the evaluation of the logbook. Collectively, logbooks are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate.

**Format for the logbook** for the different activities is given in Tables 1 and 2 of Section IV. Copies may be made and used by the institutions.

**Procedure for defaulters:** Every department should have a committee to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default the departmental committee may recommend that defaulting candidate be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set himself or herself right.

## Format of Model Checklists

### CHECKLIST-I MODEL CHECKLIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the student:

Date:

Name of the faculty/ Observer:

Sl No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross-references have been consulted					
4	Whether other relevant references have been consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

**CHECKLIST-II:  
MODEL CHECK LIST FOR THE EVALUATION OF THE SEMINAR  
PRESENTATIONS**

Name of the student:

Date:

Name of the faculty/ Observer:

Sl No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross-references have been consulted					
4	Whether other relevant references have been consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

**CHECKLIST - III**  
**MODEL CHECK LIST FOR EVALUATION OF TEACHING SKILL**

Name of the student:

Date:

Name of the faculty/ Observer:

SL. No.		Strong Point	Weak point
1	Communication of the purpose of the talk		
2	Evokes audience interest in the subject		
3	The introduction		
4	The sequence of ideas		
5	The use of practical examples and /or illustrations		
6	Speaking style (enjoyable, monotonous, etc., specify)		
7	Summary of the main points at the end		
8	Ask questions		
9	Answer questions asked by the audience		
10	Rapport of speaker with his audience		
11	Effectiveness of the talk		
12	Uses of AV aids appropriately		

**CHECKLIST - IV**  
**MODEL CHECK LIST FOR DISSERTATION / PROJECT WORK PRESENTATIONS**

Name of the student:

Date:

Name of the faculty/ Observer:

<b>S. No.</b>	<b>Points to be considered</b>	<b>Poor 0</b>	<b>Below average 1</b>	<b>Average 2</b>	<b>Good 3</b>	<b>Very Good 4</b>
1	Interest shown in selecting topic					
2	Appropriate review					
3	Discussion with guide and other faculty					
4	Quality of protocol					
5	Preparation of proforma					
	<b>Total score</b>					



## CHECKLIST – V

### CONTINUOUS EVALUATION OF DISSERTATION / PROJECT WORK BY GUIDE/ CO-GUIDE

Name of the student:

Date:

Name of the faculty/ Observer:

<b>S. No.</b>	<b>Items for observation during presentation</b>	<b>Poor 0</b>	<b>Below average 1</b>	<b>Average 2</b>	<b>Good 3</b>	<b>Very Good 4</b>
1	Periodic consultation with guide/ co-guide					
2	Depth of Analysis/ Discussion					
3	Department presentation of findings					
4	Quality of final output					
5	Others					
	<b>Total score</b>					

### OVERALL ASSESSMENT SHEET

Date:

Check list No.	Name of the students			
	A	B	C	D
1				
2				
3				

Signature of the HOD

Signature of the Principal

The above overall assessment sheet used along with logbook should form the basis for certifying satisfactory completion of course of study, in addition to the attendance requirement.

#### KEY

Mean score: Is the sum all the scores of checklists 1 to 5

A, B, C: Name of the students

#### LOG BOOK

Table 1: Academic activities attended

**Name:**

**Admission Year:**

**College:**

Date	Type of activity, Specific Seminar, Journal club, presentation, UG teaching	Particulars

**LOG BOOK**

Table-2: Academic presentations made by the student

**Name:**

**Admission Year:**

**College:**

<b>Date</b>	<b>Topic</b>	<b>Type of activity, Specific Seminar, Journal club, presentation, UG teaching</b>

## MANAGEMENT INFORMATION SYSTEM REPORT

1. Name of the college imparting M.Sc. Echocardiography

2. Details of M.Sc.

Sl. No	Name of the Branch & Teaching faculty	Sanctioned Strength	Admitted	Name of the subjects to be studied at 1 <sup>st</sup> Year M.Sc. Echocardiography	
1					
2					

3. No. of experiments/assignments conducted for 1<sup>st</sup> year M.Sc. Echocardiography students

Sl. No	Branch	Subject		Assigned by RGUHS	Conducted	%	Remarks
1.		No	Name				
2							

4. No. of theory classes conducted for 1<sup>st</sup> year M.Sc. Echocardiography students

S. No	Branch	Subject		RGUHS Norms (25)	Conducted	%	Remarks
1.		No	Name				
2.							
3.							

5. Number of theory and practical classes taken by 2<sup>nd</sup> year M.Sc. Echocardiography students for under graduate program (Optional).

6. No. of Journal clubs department wise for 1<sup>st</sup> year and 2<sup>nd</sup> year M.Sc. Echocardiography students

Total No. of students Dept Wise	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1 <sup>st</sup> year M.Sc. Echocardiography No.=	2 per candidate per year			
2 <sup>nd</sup> year M.Sc. Echocardiography No.=	2 per candidate per year			

7. Number of seminars for 1<sup>st</sup> year and 2<sup>nd</sup> year M.Sc. Echocardiography students

Total No. of students : 10	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1 <sup>st</sup> year M.Sc. Echocardiography No.=10	2 per candidate			
2 <sup>nd</sup> year M.Sc. Echocardiography No.= 08	2 per candidate			

8. Number of interdepartmental meetings

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
	2	200%	Interactive and productive

9. Number of visits to pharmaceutical industry/research center/hospital for 1<sup>st</sup> year & 2<sup>nd</sup> year M.Sc. Echocardiography students.

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1	02	200	Educative & informative

10. Number of guest lectures for postgraduate Program

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
2	03	150	Need focused and educative

11. Number of research papers published in the year in the college –

12. Any other additional information such as consultancy/collaboration/conducting Seminars & workshops or attending seminar & workshops or conference

## **SECTION-V**

### **ETHICS IN M. Sc – ECHOCARDIOGRAPHY**

**(Should be taught to the 1st year students of M.Sc. Echocardiography)**

**Introduction:** With the advances in science and technology and the increasing needs of the patient, their families and community, there is a concern for the health of the community as a whole. There is a shift to greater accountability to the society. It is therefore absolutely necessary for each and every one involved in the health care delivery to prepare them to deal with these problems. Technicians like the other professionals are confronted with many ethical problems. Standards of professional conduct for technicians are necessary in the public interest to ensure an efficient laboratory service. Every technician should not only be willingly to play his part in giving such a service, but should also avoid any act or omission which would prejudice the giving of the services or impair confidence, in respect, for technician as a body. To accomplish this and develop human values, it is desired that all the students under go ethical sensitization by lectures or discussion on ethical issues.

#### **Introduction to ethics-**

What is ethics?

General introduction to Code of Laboratory Ethics

How to form a value system in one's personal and professional life?

International code of ethics

#### **Ethics of the individual-**

Technician relation to his job

Technician in relation to his trade

Technician in relation to medical profession

Technician in relation to his profession

#### **Professional Ethics-**

Code of conduct

Confidentiality

Fair trade practice

Handling of prescription

Mal practice and Negligence

Professional vigilance

#### **Research Ethics-**

Animal and experimental research/ humanness

Human experimentation

Human volunteer research - informed consent

Clinical trials

Gathering all scientific factors

Gathering all value factors

Identifying areas of value – conflict, setting priorities

Working out criteria towards decision

ICMR/ CPCSEA/ INSA Guidelines for human / animal experimentation

### **Recommended reading**

- Francis C.M., Medical Ethics, I Edition, 1993, Jay pee Brothers, New Delhi p189.
- Good Clinical Practices: GOI Guidelines for clinical trials on Pharmaceutical Products in India ([www.cdsco.nic.in](http://www.cdsco.nic.in))
- INSA Guidelines for care and use of Animals in Research – 2000.
- CPCSEA Guidelines 2001([www.cpcsea.org](http://www.cpcsea.org)).
- Ethical Guidelines for Biomedical Research on Human Subjects, 2000, ICMR, New Delhi.
- ICMR Guidelines on animal use 2001, ICMR, New Delhi.

|



**ANNEXURE-I**  
**CATEGORIES OF BIO-MEDICAL WASTE**

	Waste Category ** Type	Treatment a Disposal ** Options
Category No. 1	Human Anatomical Waste: (human tissues, organs, body parts)	Incineration deep burial
Category No. 2	Animal Waste: (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge form hospitals, animal houses)	Incineration deep burial
Category No. 3	Microbiology & Biotechnology Waste: (wastes from laboratory cultures, stocks or specimens or micro-organisms live or attenuated vaccines, human and animal Cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	Local autoclaving / micro waving / incineration.
Category No. 4	Waste sharps: (Needles, syringes, scalpels, blades, glass, etc, that may cause puncture and cuts. This includes both used and unused sharps)	Disinfection (chemical treatment / autoclaving / micro –waving and mutilation / shredding
Category No. 5	Discarded Medicines and Cytotoxic drugs: (Wastes comprising of outdated, contaminated and discarded medicines)	Incineration / destruction and drugs disposal in secured landfills.
Category No. 6	** Solid Waste: (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, Eners, beddings, other material contaminated with blood)	Incineration Autoclaving / micro waving
Category No. 7	Solid Waste: (wastes generated form disposable items other than the waste ** sharps such as tubings, catheters, intravenous sets, etc)	Disinfection by chemical treatment, autoclaving / micro-waving and mutilation / shredding
Category No. 8	Liquid Waste: (Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities)	Disinfection by chemical treatment and discharge into drains
Category No. 9	Incineration Ash: (Ash from incineration of any biomedical waste)	Disposal in municipal landfill

\*\* As per Bio-Medical Waste (Management & Handling) (Second Amendment) Rules 200, dated 02.06.2000.

## SECTION-VI

### MINIMUM REQUIREMENT OF INFRASTRUCTURE, LABORATORY FACILITIES AND STAFF:

#### (i). Basic Infrastructure:

Institute should have its own hospital with full-fledged cardiology unit with the following facilities:

- 250 bedded cardiology / cardiac surgery services
- Echocardiography laboratory with 4 echocardiography machines
- Class room with capacity for 30 students, measuring 500 sq.ft
- One departmental Seminar room measuring 250sq.ft for each branch with A.V aids – OHP, Slide projector and computer with accessories are compulsory. LCD Projector (optional) Other infrastructure criteria- Principals room, students common room, staff room, Library, office room, Store room, preparation room etc will be as per minimum criteria. Norms of B.Sc-Cardiac Care Technology course.

#### (ii). Infrastructure subject wise

- Echocardiography equipments
  - i. Echocardiography machines – 4
  - ii. Transoesophageal echocardiography probes –2
  - iii. OPD case load for echocardiography – 10 / day
  - iv. Cardiology OPD attendance – 100 / day
  - v. Cardiology inpatient service minimum – 100 beds
  - vi. Cardiac surgical case load – 4 operations / day

#### (iii). Teaching staff requirement:

Teaching staff should be actively involved in imparting education in the particular subject:

- Professor – 1
- Associate Professor (5 years teaching experience) – 1
- Assistant Professor (3 years teaching experience) – 1
- Lecturer (M. Sc Echocardiography) – 2
- Tutor (B.Sc Cardiac care technology) – 2

#### Qualification

- DM / DNB in Cardiology
- M.Sc in Echocardiography

#### (iv). Non Teaching staff:

One-secretary, one coordinator & one peon

#### (v). Library requirements:

##### Books

1. 20 books in cardiology
2. 20 books in cardiac surgery
3. 20 books in echo cardiography

**Journals:** 4 journals in echocardiography