

SRI VENKATESWARA INSTITUTE OF MEDICAL SCIENCES

TIRUPATI – 517 507

(A University established by an act of Andhra Pradesh State Legislature)



PG Programme in Allied Health Sciences

**M.Sc Cardiac Catheterization and Interventional
Technology**

TIRUMALA TIRUPATI DEVASTHANAMS

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General Regulations

1. Title of the Course

Master of Science degree in Cardiac catheterization and Interventional Technology

2. Duration of the Course

The duration of the course shall be 2- years on full time basis

3. Eligibility for Admission

a) B. Sc in Cardiovascular Technology (3 yrs)
(or)

b) B.Sc Degree + 2 years PG diploma in ECG & CVT + 3 years Experience. Three years of Experience post 2 years Diploma in cardiovascular technology. Post general B.Sc. Degree from reputed institution on regular basis. correspondence course will not be considered.

4. Selection Criteria

Selection shall be based on the academic merit/entrance test conducted in the qualifying exam.

5. Admission schedule :

- a) Commencement of Course: August every year
- b) The admissions are closed by 30th September or 60 days from the date of commencement of the programme.

6. Medium of instruction.

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

7. Course of study

The course shall be pursued on full time basis. In the end of first year there shall be an examination. Students shall be posted to SVIMS and SPMC hospitals during the practical hours.

Subjects for study and teaching hours for first year and second year of the PG courses are shown below.

Distribution of Teaching Hours

First Year

S.No	Main subject	Theory No. of Hours	Practical No. of Hours	Total
1.	X-ray Physics, Instrumentation, Hardware's and sterility	46	120	166
2.	Electrophysiology and cardiac Pacemakers	47	120	167
3.	Cath and Intervention in ischemic & Valvular heart disease	57	140	197
4.	Epidemiology and Biostatistics	60	-	60
5.	Subsidiary subject: Medical Ethics	10	-	-
	Total :	220	380	600

Second year

Sl.No.	Main subject	Theory No. of Hours	Practical No. of Hours	Total
6.	Cath and Intervention in Congenital Heart Diseases	46	140	186
7.	Cath and Intervention in myocardial, pericardial Disease & Non cardiac intervention	47	125	172
8.	Recent Advances in Intervention	47	125	172
	Total :	140	390	530

8 a) Attendance:

A candidate is required to put in minimum 80% of attendance both in theory and practical separately of each paper before admission to the university examination. Participation in NCC, NSS, sports and games, educational tours, professional meetings and conference or other co-curricular activities representing the institution/university will not count as absence.

b) Condonation for lack of attendance:

The condonation of attendance on medical grounds or on absence under extraordinary circumstances to those who are having the attendance between 70% and 79% in each paper will be granted in genuine cases. The students who have shortage of attendance in the particular papers have to apply to the controller of examinations, indicating the reasons for shortage of attendance. The representation to be forwarded by the HOD & Prof. i/c AHS. If the reason is on the medical grounds, the relevant medical certificate has to be enclosed to the representation. If any student falls below the 70% of attendance, he/she will not be allowed to write the university examinations.

9. Scheme of examination

- The examination for the degree shall consist of written papers, practical and oral.
- There shall be two examinations viz. Preliminary and final. The preliminary examination shall be taken at the end of the first year. The final examination shall be taken at the end of 2nd year.
- The examination shall be conducted ordinarily twice a year, viz. July/August and January/February.

Preliminary Examination

This consists of theory, practical and oral. There will be separate papers for each specialization.

**University Examination and Distribution of marks
First year**

S.No	Subjects	Paper	Theory		Practical (Marks)		Viva	Grand Total
			IA	UE	IA	UE		
1.	X-ray Physics, Instrumentation, Hardware's and sterility	I	20	80	15	60	25	200
2.	Electrophysiology And cardiac Pacemakers	II	20	80	15	60	25	200
3.	Cath and Intervention in Ischemic /Valvular Heart Disease	III	20	80	15	60	25	200
4.	Epidemiology & biostatistics	IV	20	80	-	-	-	100
Total								700

Second year

S.No	Subjects	Paper	Theory		Practical (Marks)		Viva	Grand Total
			IA	UE	IA	UE		
5.	Cath and Intervention in Congenital Heart Diseases	V	20	80	15	60	25	200
6.	Cath and Intervention in myocardial, pericardial Disease & Non cardiac intervention	VI	20	80	15	60	25	200
7.	Recent Advances in Intervention	VII	20	80	15	60	25	200
8.	Dissertation		-	-	100	50		150
Total								750

Dissertation

The student should submit dissertation one month before the final examination. Those students who have not submitted the dissertation shall not be allowed to appear for the final examination. The dissertation shall be assessed at the time of orals by all the examiners.

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 be done. A declaration by the candidate that the work

was done by him/her shall be included. The guide and head of the department shall certify the bonafide of the dissertation.

Three copies of dissertation shall be submitted to the university through proper channel along with a soft copy (CD), one month before the final examinations.

6. Internal assessment (IA):

- a) A student must secure at least 35% marks of the maximum marks fixed for internal assessment in a particular subject to be eligible to appear for the university examination of that subject.
- b) There shall be three internal assessment tests and the average of these tests shall be considered for awarding final marks.
- c) If the candidate is absent for any of the exams, the marks in that exam shall be taken as zero.
- d) The computed internal assessment marks as per the regulation 10 a) & b) shall be sent to the controller of exams 15 days before the commencement of the University exam.
- e) The internal assessment marks should be signed by the concerned teaching faculty or HOD and counter signed by the HOD before being forwarded to the Controller of Examinations.
- f) For those who failed in internal assessment test/s, have to reappear as per the regulation 9 a) & b) before he/she appears for the university examination.
- g) For those who want to improve their marks in internal assessment tests, they can appear again as per the regulation 9 a) & b). For such students, the internal assessment marks of the student at the time of first appearance will be compared with the marks obtained at the present appearance and the higher of the two will be taken as his/her internal assessment marks.

11. Minimum for a pass

- a) 35% in internal assessment of each theory paper and practicals/viva voce
- b) 40% in each theory paper of university examination.
- c) 50% on the total marks of theory university examination and internal assessment clubbed together, applicable to each paper.
- d) Where, viva voce involved which is part of theory examination, 50% on the total marks of theory university examination, internal assessment and viva voce clubbed together, applicable to each paper.
- e) Where there is no internal assessment marks, 50% on the total theory marks, 50% in practicals/viva voce applicable to each subject.

Note: For 2 year PG course, where any paper contains both theory and practicals/viva voce, the student has to pass both theory and practicals/viva voce, if any student pass in theory examination and fail in practicals/viva voce examination or vice versa, the student concerned has to appear again for both theory and practicals/viva voce examination.

12. Classification of successful candidates

Percentage of Marks for declaring Class:

Distinction	- 75% and above of the total marks.
First Class	- 65 - 74% of the total marks.
Second Class	- 50- 64% of the total marks.
Pass Class	- If the student does not pass all the subjects within the duration of the course, the class will not be awarded and the final results will be declared as "Pass". Those who have break in the middle of the course due to attendance shortage, it will be taken into consideration as not completed within the duration of the course and the final results will be declared as "Pass".

13. Reappearance

The student has to pass both theory and practicals/via voce, if any student pass in theory examination and fail in practicals/viva voce examination or vice versa, the concerned student has to appear again for both theory and practicals/viva voce examination.

14. Carry-over Provision

The students are permitted to complete the course period irrespective of their success in the preliminary part. However, the final results will be kept under "withheld" until he/she passes all the previous papers".

15. Maximum duration for completion of course

A candidate shall complete the course within four years from date of admission.

Failing which, the candidate will be discharged.

16. Eligibility for award of degree

A candidate shall have passed in all the subjects of first and second year to be eligible for award of degree.

First year

Course content (syllabus) Theory

Paper I: X-ray Physics, Instrumentation, Hardwares and sterility (Total Hours: 37)

Unit No	Unit title	Content	Hours	Method of evaluation
1	Orientation and introduction to the course		1	-
2	Heart and coronary anatomy for interventional cardiology	Coronary artery and coronary sinus anatomy-Cardiac chambers and peripheral anatomy	1	Sessional examination
3	Physiology of the coronary circulation	-Coronary circulation -Valvular pathophysiology -Arterial disease and hemodynamic Approach, Ventricular pathophysiology	2	
4	Introduction to cardiac cath Lab	-Indication and contraindication for cardiac cath-Complications of cardiac cath	2	Sessional examination
	(a)Cath lab data	-Hemodynamic data -Cine angiographic data -Sterile Technique and preparation	1	
	(b)Equipment's in the cath lab	-X-ray cine angiographic system -Physiological recorder -Digital imaging formats and archiving -Equipments for PCI -Emergency equipments	2	
	Other adjunctive devices	-Atherectomy Device -Thrombectomy -Embolic protection device -IVUS, - Doppler , Pressure Wires	4	
5	Environmental safety in cath Lab Preparation and premedication of the patient	-Blood and body fluids -Blood born viruses -Universal and standard precautions -Environmental assessment -Method of protection(Skin, Eye, Nose protection) -Radiation protection	2	Sessional examination
6	Cine angiographic imaging, Radiation safety /Protection and contrast agents	GM	1	
7	Principle and catheterization	X-ray cine angiographic system -Operational radiation management	2	Sessional examination

	laboratory equipments (SP)	for patient and staff -General principle of coronary artery brachytherapy -X-ray Computed tomography and MRI of the coronary arteries -Intracardiac echocardiography in the Cath lab -Cath lab physiological recorders		n
8	Cardiac cath basic Technique (GM)	Percutaneous approach :- Femoral approach, radial and brachial approach and its advantages	2	Sessional examination
9	Angiographic techniques (GM)	-Coronary angiography -Cardiac ventriculography -Pulmonary angiography -Angiography of the aorta and peripheral artery	3	Sessional examination
10	Special cardiac catheterization techniques	-Evaluation of myocardial blood flow and metabolism -Intravascular imaging Techniques -IABP and other circulatory assist device	2	Sessional examination
11	Hardware	Hardware for -diagnostic procedures -coronary intervention -Valvular intervention -Closure devices -Pacing devices	2	Sessional examination
12	Complication of cardiac cath and optimal use of adjunctive pharmacology (GM)	-Myocardial infarction -Cerebrovascular complications -Puncture site complication -Renal dysfunction, Hypotension, -Volume overload Arrhythmia and conduction disturbances	2	
13	Right heart catheterization		1	Sessional examination
14	Left heart catheterization		1	
15	Other procedures	-Pericardiocentesis -Electrical cardio version -Endomyocardial biopsy -IABP, TEE	2	Sessional examination

16	Cardiac cath in infants and children	-	1	Sessional examination
17	Hemodynamic principles	-	1	
18	Percutaneous coronary angioplasty	-Indications -Hardwares: Guiding catheters, Guidewires, Balloons, Stents -Procedure Femoral approach Radial approach -Complication	2	Sessional examination

PAPER II: Electrophysiology and cardiac pacemakers

Total hours: 41hrs

Unit No	Unit Title	Content	Hours	Method of evaluation
1	The chest radiography in cardiovascular Diseases			Sessional examination
	The normal chest radiography	-Cardiac chambers -Aorta/GA -Lung and pulmonary vasculature	2	
	Evaluation chest radiography in heart Disease	-Lung and pulmonary vasculature -Cardiac chambers and great arteries -Pleura and pericardium	3	
2	Cardiac pharmacology			Sessional examination
	Anticoagulants	-Heparin -Low molecular weight heparin -Warfarin -Direct thrombin inhibitors	2	
	Antiplatelet	-Aspirin -Clopidogrel -glycoprotein IIb /IIIa inhibitor	2	
	Thrombolytic agents	-Streptokinase -Urokinase -Tissue plasminogen activator(TPA)	2	
	Other cardiovascular	-Atropine	3	

	drugs	-Lidocaine -Procainamide Diltiazem -Adenosine -Sodium Bicarbonate -Morphine -Calcium chloride		
	Adrenergic Receptors	-Dopamine -Dobutamine -Isoprotrenol -Nor ephinephrine -Digitalis(Digoxin) -NTG	2	
		-Beta blockers -Diuretics		
3	Cardiovascular Resuscitation			
	Basic and advanced life support	-Approach to emergency cardiac care: VF, Hypotention, VT Asystole, Pulse less electrical activity	3	
	Chance of survival	-Adjucts of airway control Airway control, Airway adjuncts, Endotracheal intubation, -Clinical profile of sudden unexpected cardiac arrest- Principle and management -Approach to treatment -Algorithms -Approach to resuscitation	2	
4	Electrophysiology			Sessional examination
	Genesis of cardiac arrhythmias Electrophysiological consideration	-Diagnosis of cardiac arrhythmias(diagnostic tests) Holter, Exercise test, HR variability, QT Dispersion and SAECG, Tilt table test	3	
	Invasive EP study	-AV blocks Sinus node dysfunction -Intra ventricular conduction disturbance Complications	2	
	Therapy for cardiac	-Pharmacological therapy(anti	3	

	arrhythmia	arrhythmic drugs classification) -Direct current electrical cardio version -ICD -Ablation therapy -Surgical therapy for tachyarrhythmia		
5	Cardiac pacemakers and ICD	-Guidelines for pacemaker, ICD and CRT -cardiac electrical stimulation principle of bioelectric stimulation -Hemodynamics of physiology pacing -Pulse generator, Hardware and components -Pacemaker modes and timing cycle -Rate adaptive pacemakers -Electrical therapy for ventricular tachyarrthmias (ICD therapy) -Trouble shooting in pacemakers and ICD. - Early and late Complications	8	Sessional examination
6	3D mapping		4	Sessional examination

PAPER III: Cath. and Intervention in Ischemic and Valvular Heart Disease

Total Hours: 32 Hrs

Sl.No	Unit title	Content	Hours	Method of evaluation
1	Understanding coronary circulation	-Pathogenesis of atherosclerotic plaques -Abnormalities of coronary perfusion -Anomalies of the Coronary circulation -Wall motion scoring Global ventricular function -Myocardial infarction -Complication of MI -Surgical aspect of IHD	3	Sessional examination
	Angiographic technique	-Femoral and radial or brachial approach	3	

		<ul style="list-style-type: none"> -Adverse effect of coronary angiography -Views and quantification of stenosis -Coronary collaterals -Coronary vasospasm -Myocardial bridge -Left ventriculography, Technique, Analysis. Complications 		
2	Coronary angioplasty	<ul style="list-style-type: none"> -Common angiographic views for coronary angioplasty -Angiographic TIMI classification of blood flow -Angiographic classification of collaterals flow -Assessment of coronary stenosis -Coronary lesion description for angioplasty -Problem and solution in the interpretation of coronary angiogram 	4	Sessional examination
3.	Complications of PCI	<ul style="list-style-type: none"> -MI during PCI -Abrupt vessel closure after PCI -Intracoronary thrombus -Dissection -Hypotension -Arrhythmia -Peripheral vascular complication 	3	Sessional examination
		<ul style="list-style-type: none"> -No flow/slow flow/No-Reflow phenomena -Stent thrombosis -Complication related to radiographic contrast media 		
4	Non balloon PCI devices	<ul style="list-style-type: none"> -Rotational ablation catheters -Directional coronary atherectomy -Thrombus aspiration system -Embolic protection devices -Cutting balloons 	3	Sessional examination
5	Restenosis, Brachytherapy and drug eluting stents	<ul style="list-style-type: none"> -In stent restenosis and management -brachytherapy -DES 	3	Sessional examination
6	Difficult situation in PCI And strategies	<ul style="list-style-type: none"> Side branch and bifurcation stenosis and approach -Eccentric stenosis -Severe calcific stenosis 	3	Sessional examination

		<ul style="list-style-type: none"> -Ostial lesions -Total coronary occlusion -Multivessel PCI -IMA PCI -PCI for bypass graft -PCI for unstable angina and acute MI -PCI for cardiogenic shock 		
7	High risk PCI	<ul style="list-style-type: none"> -Identifying the high risk PCI patient -ACC/AHA lesion classification Patient related and clinical risk factors -Risk reduction and support of the high risk PCI -Management of complication 	2	Sessional examination
8	Percutaneous therapy for valvular heart disease	<ul style="list-style-type: none"> -Haemodynamic information derived from echocardiography MS,MR,AR,AS,TR,TS -Indications for balloon valvuloplasty(MS,AS) -Angiographic assessment of valvular lesions(MR,AR) 	2	Sessional examination
	BMV	<ul style="list-style-type: none"> -Balloon selection and technique for mitral valvuloplasty - Complications 	2	
		<ul style="list-style-type: none"> -Post procedural evaluation -Management of complications 		
	Aortic Valvulolasty	<ul style="list-style-type: none"> -Indications -Technique(Retrograde and ante grade technique) -balloon selection -Procedure Complication 	2	
	Pulmonary and tricuspid valvuloplasty	<ul style="list-style-type: none"> -Management -Indications-Selection of balloons -Technique -Results -Complication 	2	

Paper IV: Epidemiology & Biostatistics

Total hours = 60

Sl.No.	Topics	60 Hours
1	Introduction Introduction to Biostatistics & Research Methodology, types of variables & scales of measurements, measures of central tendency and dispersion, Skewness and Kurtosis Rate, ratio, proportion, incidence & prevalence and their meaning.	4
2	Sampling Random & non random sampling, various methods of sampling- simple random, stratified, systematic, cluster and multistage. Sampling and non-sampling errors.	4
3	Basic probability distribution and sampling distributions Concept of probability distribution, normal, Poisson and Binomial distributions, parameters and applications. Concept of sampling distributions. Standard error and confidence intervals.	6
4	Tests of Significance Basics of testing of hypothesis - Null and alternate hypothesis, type I and type II errors, level of significance and power of the test, p value. Tests of significance (Parametric) T - test (paired & unpaired), Chi square test and test of proportion, one way analysis of variance. Repeated measures analysis of variance. Tests of significance (nonparametric) - Mann Whitney U Test, Wilcoxon Test, Kruskal - Wallis analysis of variance Friedman's analysis of variance	10
5	Correlation and Regression Simple correlation-Pearson's and Spearman's methods; testing the significance of correlation coefficient simple and multiple linear regression.	4
6	Sample size determination General concept Sample size for estimating means and proportion, testing of difference in means and proportions of two groups and more than two groups	4
7	Study Designs Descriptive epidemiological methods - case series analysis and prevalence studies. Analytical epidemiological methods - case control and cohort studies, Clinical trials / intervention studies, odds ratio and relative risk, stratified analysis.	10
8	Multivariate analysis Concept of multivariate analysis, introduction to logistic regression and survival analysis	6
9	Reliability and validity evaluation of Diagnostic Tests Cronbach's alpha and Test-retest methods	4
10	Format of Scientific documents Structure of Research protocol, structure of thesis/research report, formats of reporting in scientific journals. Systematic review and meta analysis.	8

Ethics

(Should be taught to the 1st year students)

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. Other professionals are confronted with many ethical problems.

Standards of professional conduct are necessary in the public interest to ensure an efficient laboratory service. Every technologist 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 technologist as a body.

To accomplish this and develop human values, it is desired that all the students undergo 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

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

- i) Francis C.M., Medical Ethics, I Edition, 1993, Jay pee Brothers, New Delhi p189.
- ii) Good Clinical Practices: GOI Guidelines for clinical trials on Pharmaceutical Products in India (www.cdsc.nic.in)

- iii) INSA Guidelines for care and use of Animals in Research – 2000.
- iv) CPCSEA Guidelines 2001(www.cpcsea.org).
- v) Ethical Guidelines for Biomedical Research on Human Subjects, 2000, ICMR, New Delhi.
- vi) ICMR Guidelines on animal use 2001, ICMR, New Delhi.

PRACTICALS

Paper - I: X-ray Physics, Instrumentation, Hardware's and sterility (120 Hours)

1. Cardiac catheterization laboratory demonstration: 3Hours

- i. Candidate will be allocated equipment for demonstration of procedure of maintenance,
- ii. Will be required to accompany service engineers and biomedical engineers during service visits and prepare at least six analyses of error and corrective actions taken
- iii. Candidate will be required to assist interventional cardiologist under supervision and will participate in subsequent debriefing

2. Cardiac Catheterization (3hours)

Indication and contraindication for cardiac catheterization
 Understanding the factors influencing choice of approach
 Advantages of percutaneous femoral approach
 Advantages of percutaneous radial approach
 Advantages of brachial approach

Candidate would be required to cross check the preparation and pre medication of the patient before the procedure

IV: Percutaneous approach (3hours)

Patient preparation
 Local anesthesia
 Femoral vein puncture
 Right heart catheterization
 Femoral artery puncture
 Heparanization
 Control of the puncture site
 Transeptal puncture

3. Cine Angiographic Equipment and contrast agents (3 hours)

Understanding the instrumentation setup of the angiography room, the generator, the X-ray tube, Image intensifier, Cine camera and associated optics, Radiation safety, Biological effects of radiation, Methods of assessing radiation exposure dose
 Applications of principles in obtaining, storing and retrieving optimal cine.
 Understanding the basis of Ionic and Nonionic contrast and Side effects and reaction of contrast agents

4. Pressure measurement (3 hours)

Understanding the instrumentation and principles of Pressure measuring devices, the electrical strain gauge.

Candidate will be taught about the Physiological characteristics of pressure wave forms, Wedge pressure, and Valve area assessment

5. Handling hardware's in cathlab (5 hours)

Understanding the structure, uses and maintenance of Puncture needles, Coronary and guiding wires, Diagnostic and Guiding catheters, Introducer sheaths, Coronary and Peripheral balloons, Coronary stents- bare metal and drug eluting, Peripheral stents and Valvular balloons

6. Complications of cardiac cath (5 hours)

Students will be taught to handle patients with hemodynamic instability under the supervision of the clinical staffs to understand the practice of managing them in certain scenarios, like Myocardial infraction, Cerebrovascular complications, Arrhythmia's and conduction disturbances, Perforation of the heart or great vessels, Allergic and anaphylactic reactions, Renal dysfunctions, Hypotension, Volume overload

Clinical lab posting: 70 hours

Students will be posted in the cardiac catheterization laboratory for the observation and to develop practice in assisting the coronary angiogram and interventions

Hands on practical work: 25hours

Students will be allowed to assist the catheterization procedure independently under the supervision of the faculty to develop the skill and experience.

Paper - II: Electrophysiology and cardiac pacemakers - 120 hours

Basic and advanced life support: (5 hours)

Understanding the primary and secondary approach to emergency cardiac care/ pulse less ventricular tachycardia, Ventricular fibrillation, asystole and hypotension

Cardiac Pacemakers: (10 hours)

To know Indications and instrumentation for Different types of Pacemakers

- Single chambered Pacemakers
- Dual chambered Pacemakers
- Biventricular Pacemakers
- Implantable Cardioverter Defibrillators.
- Pacemaker Programming and trouble shooting
- Pacemaker site complications and Infection.

Clinical lab posting: 80 hours

Students will be posted in the cardiac catheterization lab, for the observation and to identify the correlation of clinical diagnosis with the angiographic findings with the help of clinical features, blood investigations, ECG, X-RAY etc.

Students will be recruited in the lab for the observation of the cardiac pacemakers and defibrillator implantation and to understand various technics.

Students will be demonstrated for ACLS and BLS to provide hands on managing a patients with cardiac emergencies, during and post procedural status and will be posted clinically in ICCU for the observation and experience.

Hands on practical work: 25hours

Students will be allowed to read ECG and report X-RAY, ICD and pacemaker lead positioning, adjusting the parameters during and post implantation procedure when indicated, to analyze the pacemaker function on follow up and to diagnose the malfunctioning of pacemaker independently under the supervision of the faculty.

**Paper III Cath. and Intervention in ischemic and valvular heart disease
140 hours**

1 Coronary angiography: technique and procedure steps- 5 hours

- Insertion and flushing of coronary catheter
- Coronary anatomy
- Injection technique
- Pressure damping and ventricularisation
- Cannulation of coronary ostium
- Cannulation of coronary grafts
- Angiographic views and quantitation of stenosis
- Lesion quantification
- Coronary co-laterals
- Coronary vasospasm
- Myocardial bridges
- Ventricular injection, catheter selection, injection site, rate and volume
- Foreign body's removal

Coronary angioplasty: techniques and procedure steps- 5 hours

- Coronary guiding catheters
- Coronary guide wires: J tip, straight tip, CTO wires, retrograde technique.
- Dilatation catheters: Compliant and non-compliant
- Complications
- Stent designs and types
- Wire coils
- Slotted tubes
- Bifurcating stents
- Complications of stenting
- Coated stents
- Drug eluting stents
- Covered stents
- Radioactive stents

Calculation of stenotic valve orifice area: 2 hours

- Gorlin formula
- Mitral valve area
- Aortic valve area
- Tricuspid and pulmonary valve area

Percutaneous coronary and valvular interventions: 8 hours

Balloon percutaneous transluminal coronary angioplasty
Coronary atherectomy
Directional coronary atherectomy
Rotational atherectomy
Catheter based thrombolysis and mechanical thromboectomy
Distal embolic protection device
The spider filter
EPI filter wire
Angio guard device
Accune devices
Rubicon filter
Interceptor filter
Total occlusion crossing device
In-stent restenosis
Radiation brachiotherapy for in-stent restenosis
Vascular closure device
Anticoagulation during percutaneous coronary intervention
Mitral valvuloplasty
Aortic valvuloplasty
Pulmonary valvuloplasty
Tricuspid valvuloplasty

Percutaneous coronary intervention in MI and management of complication: 5hours

Uses of thrombus aspiration catheters, administration of intra-arterial and intra venous drug, Intra-aortic balloon pump insertion, etc

Clinical lab posting: 80 hours

Students will be posted in the cardiac catheterization laboratory for the observation and to develop practice in assisting the diagnostic investigation and therapeutic procedures in ischemic and valvular heart disease by cardiac catheterization.

Hands on practical work: 35hours

Students will be allowed to assist the procedure of the intervention independently under the supervision of the faculty to develop the skill and experience.

Second year - Theory

Paper V: Cath and Intervention in Congenital Heart Disease

Total Hours: 50 Hrs

Sl.No	Unit title	Content	Hours	Method of evaluation
1	Introduction		1	
2	Basics	Shunt detection and Quantification - detection of left to right intracardiac shunts -oxymetry run-calculation of pulmonary blood flow and resistance(QP and PVR),-Calculation of systemic blood flow and resistance(QS and SVR),-Flow ratio-calculation of bidirectional Shunt, -Eisenmenger's physiology	3	Sessional examination
3	Indications for CHD	Diagnostic catheterization indications and angiographic views in CHD	2	Sessional examination
4	Approach to the paediatric cath		1	Sessional examination
5	Cardiac output measurement	Various methods	2	Sessional examination
6	Oxygen consumption measurements	Various methods and pitfalls	2	Sessional examination
7	Oxygen saturation	Oxymetry run	2	Sessional examination
8	Blood flow	Qp, Qs, Qep, Qes calculation	3	Sessional examination
9	Vascular resistance	SVR, PVR	3	Sessional examination
10	Intra cardiac shunt lesions	Step-up and step-down of O ₂ saturation shunt calculation	6	Sessional examination
11	Interventions in acyanotic heart disease CHD	Cath, angiography and intervention in PFO, ASD VSD -PDA	10	Sessional examination
12	Cyanotic Heart disease	TGA, TAPVC, TA, DORV, DOLV, Ebstein, HLHS,	10	Sessional examination
13	Extracardiac shunts	Fistulas intervention	3	Sessional examination
14	Venacaval anomalies	Intervention	2	Sessional examination

Paper VI: Cardiac Cath and Intervention in myocardial, pericardial Disease & Non cardiac intervention

Total Hours: 33Hrs

Sl. no	Unit title	Content	Hours	Method of evaluation
1	Introduction		1	
2	Hypertrophic cardiomyopathy	Morphological variants, diagnosis, hemodynamics, assessing gradients, evaluation of therapy, pre and post procedural evaluation PTsMA methodology and complications	4	Sessional examination
3	Idiopathic dilated cardiomyopathy	Diagnosis and differentiation from other disorders Myocardial biopsy	2	Sessional examination
4	Restrictive cardiomyopathy	Diagnosis, hemodynamics	2	Sessional examination
5	Disease of the pericardium	Pericardial effusion Detection , quantitation of fluid Cardiac tamponade, pericardial aspiration Techniques Constrictive pericarditis Differentiation from Restrictive cardiomyopathy	4	Sessional examination
6	Aortic disease	Aortic dilation and Aneurysm Aortic dissection diagnosis and classification False aneurysm RSOV aneurysm Intervention in aortic aneurysm Aorto-LV tunnel Atherosclerosis	4	Sessional examination
7	Vascular Intervention	Mesenteric, celiac, Iliac artery intervention	3	Sessional examination
8	Carotid and cerebrovascular intervention	Aortic arch classification, intervention and complications CoA intervention	4	Sessional examination
9	Upper and lower extremity	Intervention and complications	3	Sessional examination
10	Renal artery intervention	Intervention and complications	3	Sessional examination
11	Venous intervention	IVC filter, Budd Cheri intervention, CS intervention	3	Sessional examination

Paper VII: Recent Advances in Intervention

Total Hours: 37 Hours

Sl. No	Unit title	Content	Hours	Method of evaluation
1	Introduction		1	Sessional examination
2	Percutaneous Mitral Valve Repair		3	Sessional examination
3	Percutaneous Aortic valvular approach	Percutaneous heart valve Implantation TAVI Mitral clip	5	Sessional examination
4	Pulmonary and Tricuspid valve implantation		4	Sessional examination
5	Stem Cell Therapy for IHD		1	Sessional examination
6	Percutaneous Ballon pericardiomy for patient with Pericardial effusion and tamponade		2	Sessional examination
7	The LAA intervention	LAA closure device implantion	2	Sessional examination
8	PTSMA		2	Sessional examination
9	Support & Adjunct Devices	Support devices for High risk percutaneous coronary interventions. -Cutting Balloon, Thrombectomy Laser, Ultrasound & Atherectomy	3	Sessional examination
10	Cardiac Assist devices	Impella ECMO	3	Sessional examination
11		Intracoronary Pressure & flow measurement IVUS & OCT Functional Flow Reserve (FFR)	3	Sessional examination
12	Trials	Preclinical and clinical trails	3	Sessional Examination
13	CRT	Resynchronization therapy for heart failure and combo device	3	Sessional examination
14	Quantitative CAG	Coronary angiography	2	Sessional examination

PRACTICALS

Paper - V: Cath And Intervention in Congenital Heart Disease:

(140 Hours)

Cardiac catheterization in infants and children's: (5hours)

Sedation and anesthesia

Equipment used in catheterization

Catheters, contrast media, Control of radiation

Cardiac catheterization in various congenital heart diseases: 35 Hours

1. Right heart catheterization: Indications, approach, views, chamber identification
2. Left heart catheterization: Indications, approach, views, chamber identification
3. Instrumentation used in chamber injection and to obtain pressure recordings
4. Diagnosing shunt/obstructive lesion and flow direction with QP/QS from the hemodynamic data of oxygen saturation and pressure of different chambers given
5. Abnormalities of right ventricular inflow
6. Abnormalities of left ventricular inflow: Pulmonary veins, left atrium, and mitral valve.
7. Abnormalities of right ventricular outflow: Right ventricle, pulmonary valve, pulmonary artery
8. Abnormalities of left ventricular inflow: subvalvular obstruction, Valvular aortic stenosis, supravalvular aortic stenosis.
9. Coarctation of the aorta
10. Abnormalities of cardiac septation: Atrial septal defect, ventricular septal defect, endocardial cushion defect.
11. Abnormalities vascular connection and structures: patent ductus arteriosus, abnormal systemic venous connections, abnormal pulmonary venous connections, abnormalities of the coronary circulation.
12. Cono-truncal abnormalities: Tetralogy of Fallot, transposition of the great arteries, double outlet right ventricle, persistent truncus arteriosus and aortopulmonary window.

Candidate would be required to present cases who are diagnosed and intervened for the above conditions, once in a week. They will be allowed to formulate the diagnostic questions independently. The candidate will be analyzed by the faculty for the performance on the basis of diagnostic skill with the interpretation of the disease and looked for the knowledge on therapeutic modality. This will be followed by the brief discussion.

Clinical lab posting: 75 hours

Students will be posted in the cardiac catheterization laboratory for the observation and to develop practice in assisting the diagnostic investigation and therapeutic procedures in various congenital heart disease by cardiac catheterization.

Hands on practical work: 25hours

Students will be allowed to assist in intervention associated with ASD, VSD, PDA device closure, CoA stenting, Balloon aortic valvuloplasty and balloon pulmonary valvuloplasty independently under the supervision of the faculty to develop the skill and experience.

**Paper -VI: Cath and intervention in Myocardial, Pericardial, Aortic
and Systemic Disorders & Non Cardiac Diagnosis 125 Hours**

25 Hours

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 hemodynamics, 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.
5. **Diseases of the aorta:** Aortic dilatation and aneurysms, Aortic dissection-diagnosis and classification, false aneurysms, aneurysms of the aortic sinuses- rupture, hemodynamics, pre-and post-surgical evaluation. Miscellaneous-trauma, infections, aorta-left-ventricular tunnel, atherosclerosis.
6. **Systemic disorders:** Diabetes, hypertension, renal failure, neurological conditions,.
7. **Cardiac masses:** Normal variants, primary cardiac neoplasms and secondary involving the heart, secondary effects, extra cardiac masses, intra cardiac thrombi,
8. **Aorta and peripheral artery Intervention**
 - Thoracic aorta
 - Aortic coarctation
 - Aortic aneurysm
 - Aortic dissection
 - Abdominal aorta
 - Subclavian and vertebral arteries
 - Carotid arteries
 - Renal arteries
 - Pelvic and lower extremities
9. **Atrial septostomy**
 - Balloon atrial septostomy
 - Blade atrial septostomy
10. **Balloon valve dilation**
 - Pulmonary/aortic/mitral/tricuspid valve
 - dilatation
11. **Percutaneous transluminal septal myocardial ablation**
 - Indication, Procedural steps, left ventricular outflow gradient assessment, Brocken brough phenomena and complications
12. **Dilatation of peripheral systemic arteries**

13. Re COA of aortic dilation

14. Recent developments in echocardiography in myocardial, pericardial, aortic and systemic disorders

Candidate would be required to present cases who are diagnosed and intervened for the above conditions, once in a week. They will be allowed to formulate the diagnostic questions independently. The candidate will be analyzed by the faculty for the performance on the basis of diagnostic skill with the interpretation of the disease and looked for the knowledge on therapeutic modality. This will be followed by the brief discussion.

Clinical lab posting: 75 hours

Students will be posted in the cardiac catheterization laboratory for the observation and to develop practice in assisting the diagnostic investigation and therapeutic procedures in various miscellaneous heart diseases by cardiac catheterization.

Hands on practical work: 25hours

Students will be allowed to assist in intervention associated with Alcohol septal ablation, aneurysm stenting, peripheral arterial intervention, IVC filters, CoA stenting, independently under the supervision of the faculty to develop the skill and experience.

paper- VII: Recent advances in Intervention:

125 hours

Recent Advances in cardiology : 25 hours

- i) Cardiac Resynchronization Therapy
- ii) Cardiac Assist devices
- iii) Fractional Flow Reserve (FFR)
- iv) Intra Vascular Ultrasound
- v) Rotablator
- vi) Bio-absorbable stents
- vii) Optical Coherence Tomography

Clinical lab posting: 75 hours

Students will be posted in the cardiac catheterization laboratory for the observation and to develop practice in assisting the diagnostic investigation and therapeutic procedures in various cardiac and non-cardiac interventions.

Hands on practical work: 25hours

Students will be allowed to assist in FFR or/& IVUS guided coronary intervention, Rotablation procedure and in cardiac resynchronization therapy independently under the supervision of the faculty to develop the skill and experience.

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) **Work diary / 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.

Log book:

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	Below average	Average	Good	Very Good
		0	1	2	3	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: _____

SI No.	Items for observation during presentation	Poor	Below average	Average	Good	Very Good
		0	1	2	3	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: _____

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

Checklist – V

Continuous Evaluation of dissertation / project work By

Guide/ Co-Guide

Name of the student: _____ Date: _____

Name of the faculty/ Observer: _____

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

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 Prof. i/c AHS

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:

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

Table-2: Academic presentations made by the student

Name:

Admission Year:

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

Management Information System Report

1. Name of the college imparting Cardiac Catheterization and Interventional Technology
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 st Year M.Sc.	
1					
2					

3. No. of experiments/assignments conducted for 1st year M.Sc. Cardiac catheterization and Interventional Technology students

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

4. No. of theory classes conducted for 1st year M.Sc. Cardiac catheterization and Interventional Technology students

Sl.No	Branch	Subject		SVIMS University Norms(25)	Conducted	%	Remarks
1.		No	Name				
2.							

5. Number of theory and practical classes taken by 2nd year M.Sc. Cardiac catheterization and Interventional Technology students for under graduate program (Optional).
6. No. of Journal clubs department wise for 1st year and 2nd year M.Sc. Cardiac catheterization and Interventional Technology students

Total No. of students Dept. Wise	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1 st year M.Sc. Cardiac catheterization and Interventional Technology No.=	2 per candidate per year			
2 nd year M.Sc. Cardiac catheterization and Interventional Technology No.=	2 per candidate per year			

7. Number of seminars for 1st year and 2nd year M.Sc. Cardiac catheterization and Interventional Technology students

Total No. of students : 10	Norms for half yearly Report	Achieve d Number	% Achievement	Remarks
1 st year M.Sc. Cardiac catheterization and Interventional Technology No.=10	2 per candidate			
2 nd year M.Sc. Cardiac catheterization and Interventional Technology 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 1st year & 2nd year M.Sc. Cardiac catheterization and Interventional Technology 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 & workshop or attending seminar & workshops or conference

Suggested Reading:

1. Grossman's : Cardiac Catheterization & Angiography – Donald Bairn
2. TOPOL : Text book of interventional Cardiology
3. Morton Kern : Cardiac Catheterization Hand book
4. Thach N. Nguyen : Practical Tips & Tricks
5. George . D. Dangas : interventional Cardiology Principles & practice
6. Myeong Kittong : Coronary imaging and physiology
7. James E. Lock: Cardiac Catheterization in Congenital Heart Disease
8. Charles E. Mullins: Cardiac Catheterization in Congenital heart Disease
9. Marton Kem: interventional Physiology in Cath Lab
10. Punit Ramrakha: Oxford Hand Book of Cardiology
11. KDS : Jonathan Timperley : Oxford Hand book of Pacemaker
12. Kennetn. A Ellenbogen: Clinical Cardiac Pacing
13. Tom Kenny : Nuts & Bolts of Cardiac pacing
14. Lionel Opie : Drugs for the Heart

Sl. No.	Subject	No. of Contact Hours	Code	Grade	Remarks
1	Basics in Intervention		C,L	P	
2	Cardiac cath in Infants and child		C,L	P	
3	Electrophysiology, Pacemakers and CRT		C,L	P	
4	Cath and Intervention in congenital heart disease		C,L	P	
5	Cath and Intervention in VHD		C,L	P	
6	Cath and Intervention in IHD		C,L	P	
7	Clinical Cardiology		C,L	P	
8	Basic and advanced Life support		C,L	P	
9	Cardio vascular Pharmacology		C,L	P	
10	Non cardiac intervention and Peripheral vessel intervention		C,L	P	
11	Recent Advances		L,C	P	
12	Cath lab hardwares		L,P	P	
13	Ischemic heart disease		PL	P	
14	Peripheral and valvular heart disease		PL	P	
15	Epidemiology and Biostatistics		L	P	
16	Intensive coronary care unit		PL, C,L,P	P	
17	Teaching methodology		SD	P	
18	Myopericardial, Aortic, Systemic disorder & non cardiac diagnosis		PL	P	
19	Medical ethics		L	P	
20	FFR, IVUS		L,P	P	
21	OCT		L	P	
22	Seminar presentation		SS, I(G)		Classes for UG's
23	Attending rounds with Cardiologists		C	P	
24	Rotator		L,P	P	
25	Overall cath lab postings and attending the cases	500	PL	P	

DESCRIPTION OF CODES

- C : Clinical Teaching
- D : Demonstration of Faculty
- I : Independent Work by Student
- I (G) : Independent Work by Student Guided by Faculty
- L : Classroom Lectures by Faculty
- P : Hands on Practical Work by Students
- SD : Self Directed Study by Student
- SD (E) : Self Directed Study by Student with Faculty Evaluation
- SS : Student Conducted Seminars with Faculty Moderation and Evaluation by Peers and Faculty
- PL : Practical / Clinical Lab Posting

Prof. & Course Incharge

Sr.Prof.& HOD

Prof. i/c AHS

CHECKLIST - I

Model Check List for Evaluation of Teaching Skill

SL. No.		Poor 0	Below average 1	Average 2	Good 3	Very good 4
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					

10	audience					
	Rapport of speaker with his audience					
11	Effectiveness of the talk					
12	Uses of AV aids appropriately					

CHECKLIST - II

Model check list for Dissertation / Project Work Presentations

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

Overall Assessment of the student by the clinical/Lab work:

Sl. No	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4	Excel lent 5
1	Attendance						
2	Punctuality						
3	Interaction with colleagues and support staff						
4	Maintenance of case						
5	Topic Presentation						
7	Time sense						
8	Knowledge						
9	Rapport with patient.						
10	Overall quality of work						
	Total Score	--	--	--			

MODEL QUESTION PAPER

THEORY

Each theory paper will have

- | | |
|--|----------------|
| 1) Essay questions – 03 nos. carrying 10 marks each | - 03 x 10 = 30 |
| 2) Short answer questions – 10 nos. carrying 05 marks each | - 10 x 05 = 50 |

	Total	= 80
Internal assessment		= 20

PRACTICAL

(a) Preliminary:

Internal assessment	:	15
University examination	:	60

(b) Viva

Total	=	75
	=	25