

THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY

69, ANNA SALAI, GUINDY, CHENNAI - 600 032.



SYLLABUS

OF

M.Sc. INTERVENTIONAL CARDIOLOGY

ACADEMIC YEAR 2024 – 2025 SESSION ONWARDS

FIRST YEAR

M.Sc. Interventional Cardiology

Core Subjects
Theory
Introduction to Non-Invasive Techniques in Cardiology
Invasive Cardiology
Research Methodology & Biostatistics
Practical
Introduction to Non-Invasive Techniques in Cardiology
Invasive Cardiology
Research Methodology & Biostatistics
Core Elective Course
Basics of Clinical Skills Learning
Hospital Operation Management

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	Introduction to Non-Invasive Techniques in Cardiology

Teaching Objective	To teach students about common non-invasive techniques, investigations carried out with indications and complications
Learning Outcomes	- Identify indications for non-invasive techniques based on international guidelines - Identify indications for non-invasive techniques.

Sr. No.	Topics	No. of Hrs.
1	BASICS OF ELECTRODE PLACEMENT AND LEAD SELECTION AND AXIS DEVIATION: Basics of Electrodes and Leads, ECG deflections: Isoelectric, Upright, Negative and Biphasic, Types of ECG leads- Standard limb leads, Precordial leads and the Wilson central, Augmented limb leads, Unipolar V/S Bipolar leads, Placement of leads with universal color code, Hexa-axial reference frame and Electrical axis, X axis – time presentation, Y axis – voltage presentation, Right & Left axis in normal ECG, Einthoven's Triangle, Deviation of Axis.	10
2	STRESS TEST: Protocols, lead placement, instruction to the patient, rhythm analysis, Types of Exercise stress tests.	10
3	ECG COMPONENTS-WAVES AND INTERVALS: ECG waveforms: Rate, Rhythm and Normal time intervals-The Normal Electrocardiogram, The Normal P wave & Atrial repolarization, Atrioventricular node conduction and the PR segment, Ventricular activation and the QRS complex, Genesis of QRS complex, Ventricular recovery and ST-T wave, Normal variants and Rotation of the heart, ECG PAPER, Rate measurement: Six second method, Large box method, Small box method	10
4	ECHOCARDIOGRAPHY TECHNIQUES: BASIC PRINCIPLES, INDICATIONS AND USES OF: 2D Transthoracic Echocardiography, M-mode, Echo windows and views used in Transthoracic echocardiography, Doppler echocardiography in detail: Pulsed, Continuous wave and Color flow mapping	10

5	KNOBOLOGY AND INSTRUMENTATION: Transducer: Basic principle and working, Types of Transducers, Piezoelectric crystals and its effect, Various knobs used on Echo machine with its description and application	10
6	BASICS OF TOE, STRESS ECHO & CONTRAST ECHO: Advantages & Disadvantages, Applications, Indications & Contraindications, Complications, Patient positioning and medications used	10
Total		60 hrs

Introduction to Non-Invasive Techniques in Cardiology

Sr. No.	Topics	No. of Hrs.
1	Steps to perform an 12 lead ECG	15
2	Patient positioning according to various conditions.	15
3	Proper communication with patient to find out the history	15
4	ECG machine operating and maintenance	15
Total		60 hrs

Recommended Learning Resources:

Text Books:

1. ECG Made Easy –AtulLuthra
2. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test
3. Echo Made Easy: Sam Kaddoura
4. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
5. Feigen Baum's EchocardiographyTajik Jamil for Echocardiography.

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	Invasive Cardiology

Teaching Objective	- To enable students, understand new techniques for procedures in and around the heart emerge that again need expert knowledge and manual dexterity. - To understand such interventions which include diagnostic and therapeutic electrophysiology; implantation or exchange of complex pacemaker systems or percutaneous cardioverter- defibrillator-pacers; percutaneous valve repairs or replacements etc.
Learning Outcomes	To enable students to not only be a helping hand to those just starting out in the specialty but also to serve as a reference for those who have been working in Invasive field for some time

Sr. No.	Topics	No. of Hrs.
1	CONTRAST MEDIA: Basics, Definition of Hydrophilicity, Osmolarity, and Viscosity, Contrast Agents used in the CCL, Uses, Complications, Contrast medium reactions: Mild, Moderate, Severe, Allergies: Anaphylactic and Anaphylactoid Reaction, Contrast-Induced Nephropathy (CIN)	8
2	IVUS: History, Angiography vs. IVUS, IVUS systems, Diagnostic Applications of IVUS, Complications of IVUS, Optical Coherence Tomography (OCT)	8
3	FUNCTIONAL ASSESSMENT OF CORONARY DISEASE: Intravascular Pressure Measurement: Coronary Pressures and Fractional Flow Reserve	8
4	PTCA: History, Indications, Materials used, Types of Angioplasty balloons (OTW, SOE, Fixed-wire balloons, Perfusion balloons, Compliant and Non-Compliant balloons, Stent Implantation, Contraindications, Complications	8
5	IC HARDWARES: Stents: Composition, Types, Guidewires: Composition, Types, Catheters: Diagnostic and Guiding	8

6	IABP AND OTHER CARDIAC ASSIST DEVICES: IABP- Physiologic Principles of Counter pulsation, Indications, Contraindications, Insertion, Timing: Timing errors, Troubleshooting, Weaning and Balloon Removal, Complications, Basics of Percutaneous ventricular assist devices: Tandem Heart, Impella, Percutaneous Coronary Bypass	8
7	PERIPHERAL CAROTID ANGIOGRAPHY: Introduction, Cerebrovascular Anatomy and pathology, Diagnosis and patient selection, Patient preparation, Diagnostic procedure, Post procedure Care	6
8	CARDIAC PHARMACOLOGY: Local Anesthetics, Analgesics And Sedatives: Opioids, Morphine, Fentanyl, Diazepam, Midazolam, Lorazepam, Vasodilators: Nitroglycerine, Sodium Nitroprusside, Beta receptor blockers: Metoprolol, Propranolol, Esmolol, Labetalol, Calcium Channel Blockers: Diltiazem, Verapamil, Nicardipine, Anticoagulation Agents: Platelet Aggregation Inhibitors, Aspirin, Clopidogrel, Glycoprotein IIb/IIIa Inhibitors, Tirofiban, Heparin, Warfarin, Thrombolytics: Streptokinase, Urokinase, Anistreplase, rTPA, Reteplase, Tenecteplase	6
	Total	60 hrs

Invasive Cardiology

Sr. No.	Topics	No. of Hrs.
1	Learn about Probe and Scanner settings.	15
2	Learn about Structural and Functional assessment of the heart.	15
3	Learn about various windows and views used in Echocardiography.	15
4	Learn about qualitative reporting system along with various software's associated with Echo reporting.	15
Total		60 hrs

Recommended Text Books:

1. Invasive Cardiology, 4th Edition by Sandy Watson.

Reference books or related websites:

1. The Interventional Cardiac Catheterization Handbook, 6th Edition by Morton J. Kern

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	Research Methodology & Biostatistics

Teaching Objective	The course is intended to give an overview of research and statistical models commonly used in medical and bio-medical sciences. The goal is to impart an intuitive understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyse the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Learning Outcomes	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis interpretation & reporting of results and use of statistical software.

Sr. No.	Topics	No. of Hrs.
A	Research Methodology:	
1	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research , Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report	5
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.	5
3	Sampling Designs: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non probability sampling), How to Select a Random Sample?, Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, Multi-stage sampling, Sampling	5

	with probability proportional to size, Sequential sampling.	
4	Measurement in research: Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Possible sources of error in measurement, Tests of sound measurement	5
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	5
6	Sampling Fundamentals : Need and importance for Sampling, Central Limit Theorem,	5

	Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.	
B	Biostatistics	
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs	3
8	Measures of Central Tendency and Dispersion: Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3
9	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Normal distribution, data transformation Important Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance, Testing the Equality of Variances of Two Normal Populations.	6
10	Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2
11	Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2
12	Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of ANOVA, One-way ANOVA, Two-way ANOVA, ANOVA in Latin- Square Design Analysis of Co-variance (ANOCOVA), ANOCOVA Technique.	4
13	Nonparametric or Distribution-free Tests: Important Nonparametric or Distribution-free Test Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test KruskalWalli's test, Friedman's test, and Spearman Correlation test.	3

14	Vital Health Statistics: Measurement of Population: rate, crude rate, specific rate, Measurement of fertility: specific fertility rate, Total fertility rate, Reproduction rate, Gross Reproduction Rate, Net Reproduction Rate, Measures related to mortality: Crude Death Rate (CDR), Age-specific death Rate, Infant and child mortality rate, Measures related to morbidity.	4
15	Computer Application Use of Computer in data analysis and research, Use of Software and Statistical package. Introduction to SPSS. Importing data from excel, access, tab and comma separated files. Entering data, labeling a variable, coding and recoding a categorical and continuous variable. Converting data from string to numeric variables, sorting & filtering, merging, appending data sets. Frequencies, descriptive statistics, cross tabulations. Diagrammatic presentation include histogram, bar chart, pie chart, scatter diagram, box plot, line chart. Parametric test of hypothesis-one sample, Independent and paired sample t test, one way ANOVA& post HOC test. Testing for normality,Chi-square test with measures of association. Pearson correlation. Non parametric test.	3
Total		60 hrs

Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs
A	Research Methodology	
1	Sampling Designs	4
2	Measurement in research	5
3	Methods of Data Collection	3
4	Sampling Fundamentals	3
B	Biostatistics	
5	Data Presentation	4
6	Measures of Central Tendency and Dispersion	4
7	Testing of Hypotheses	12
8	Chi-square Test	2
9	Measures of Relationship	3
10	Analysis of Variance and Covariance	4
11	Nonparametric or Distribution-free Tests	4
12	Vital Health Statistics: Measurement of Population	6
13	Computer Application Using Statistical Software	6
Total		60 hrs

CORE ELECTIVE COURSES

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	Basics of Clinical Skills Learning

Teaching Objective	☐ To Understand the basic ideas on how to check for Vital Signs of the Patient ☐ In this course the Student will learn how to handle the patients and their positioning ☐ They will also learn on the Basics of Nasal-Gastric Tube ☐ The Students will learn on Administration of IV, IV and Medication ☐ Also they will know about Cleanliness in the Asepsis
Learning Outcomes	● After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines ● The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

Sr. No.	Topics	No. of Hrs.
1	MEASURING VITAL SIGNS: Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale	5
2	PHYSICAL EXAMINATION: Observation, Auscultation(Chest), Palpation, Percussion, History Taking	10
3	FEEDING: ENTRAL FEEDING, NG TUBE: Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parenteral Nutrition.	10

4	ADMINISTRATIONS: Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set, Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter, Venturi Mask, face mask)	10
5	ASEPSIS: Hand wash Techniques,(Medical, Surgical) Universal Precaution, Protecting Equipment: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire ,Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment	5
6	MOBILITY AND SUPPORT: Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints	5
Total		45 hrs

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	Hospital Operation Management

Teaching Objective	☐ To promote scientific management of hospital and advancement of health care systems so as to make it rational, responsive and cost efficient ☐ To promote the development of high quality of hospital care in the community and the country. ☐ It has to provide a satisfactory environment to the patient and also to the doctors for clinical research.
Learning Outcomes	• Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors • Communicate effectively and develop their leadership and teambuilding abilities • Apply modern change management and innovation management concepts to optimize structures • Analyze existing hospital service policies and enhance their alignment within the local and national context

Sr. No.	Topics	No. of Hrs.
1	MEDICO-LEGAL CASES: Introduction, Laws associated with Medico-Legal Cases, Three	5

	Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession,	
2	CONSIDERATIONS OF ETHICS: Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials	10
3	HOSPITAL INFORMATION SYSTEM(HIS): Hospital Information System Management, software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges	10
4	EQUIPMENT OPERATIONS MANAGEMENT: Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS	10
5	ROLE OF MEDICAL RECORDS IN HEALTH CARE MANAGEMENT: Computers for Medical records, Developments of computerized medical record information processing system(EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	10
Total		45 hrs

SECOND YEAR

M.Sc. Interventional Cardiology

Core Subjects
Theory
Echocardiography- Advanced
Quality Assurance, Standardization & Accreditation (Cardiac Care)
Dissertation/Project*
Practical
Echocardiography- Advanced
Seminars

Name of the Programme	M.Sc. Interventional Technology
Name of the Course	Echocardiography- Advanced

Teaching Objective	•To provide practically and clinically useful application of Echocardiography. •To explain echo techniques available and to put echo into a clinical perspective.
Learning Outcomes	•To develop an understanding regarding Echocardiography. •To train students to perform Echocardiography examinations by explaining the position of transducers. •To make students aware of recent advances in Echocardiography. •To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

Sr. No.	Topics	No. of Hrs.
1	ECHOCARDIOGRAPHY FOR CORONARY ARTERY DISEASE: a. Understanding coronary circulation: Coronary anatomy and physiology, pathogenesis of atherosclerotic plaques, abnormalities of coronary perfusion, wall thickening b. Wall motion segmentation, analysis and scoring: Segmental analysis for wall motion defects, coronary artery territories, detection and quantitation of Ischemic muscle-wall motion scoring, Ischemic Cardiomyopathy c. Myocardial infarction: Detecting and assessing MI, co-relation with coronary anatomy, prognostication following MI. Complications of MI: Aneurysm, pseudo aneurysm, Ventricular Septal Defect, thrombi-embolic potential, right ventricular involvement d. Stress echocardiography: Protocols for stress echocardiography, detection of reversible Ischemic, detecting inducible ischaemia/viability, specificity and sensitivity e. 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 f. Role of CT Angiography, MRI and Nuclear perfusion & myocardial viability in CAD g. LVAD: indications, technique and post-op evaluation	20

2	ECHOCARDIOGRAPHY FOR VALVULAR HEART DISEASE: a. Haemodynamic information derived from Normal Echocardiography b. Mitral stenosis: Etiopathogenesis, pathophysiology and haemodynamics, diagnosis, assessing severity, secondary effects, assessment for balloon mitral valvotomy- Transesophageal echocardiography and its uses c. 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 postoperative, assessment for mitral valve repair, use of three dimensional echocardiography for mitral valve surgery, flail mitral valve, papillary muscle dysfunction. mitral annular calcium. d. 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 e. Aortic regurgitation: Etiopathogenesis and haemodynamics, diagnosis, assessing severity, secondary effects, relevant aspects of left ventricular function, timing of surgery, preoperative and post-operative assessment. f. Tricuspid & Pulmonary 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, infundibular, valvar, supra valvar and peripheral pulmonic stenosis, approach to pulmonary artery hypertension. g. 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.	20
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3	ECHOCARDIOGRAPHY IN MYO-PERICARDIAL, AORTIC, SYSTEMIC DISORDERS & CARDIAC MASSES: a. Hypertrophic Cardiomyopathy: Morphological variants, diagnosis, hemodynamics, assessing intracavitary and outflow tract gradients, evaluation of therapy, pre and postprocedural evaluation. b. 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 c. Restrictive Cardiomyopathy: Diagnosis and haemodynamics, infiltrative cardiomyopathies, miscellaneous- myocardial diseases in neuromuscular disorders, infectious agents and toxins. d. Diseases of the pericardium: Pericardial effusion: Detection of fluid, diagnosis- pleural versus pericardial fluid, quantitation, loculated effusions, cardiac tamponade-diagnosis, haemodynamicsetiology, pericardiocentesis Constrictive pericarditits: Diagnosis and haemodynamics. Differentiation from restrictive Cardiomyopathy, pre and post-surgical evaluation.	20
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	Miscellaneous: acute pericarditis, pericardial thickening, pericardial cysts, absent pericardium. e. 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. f. Echocardiography in systemic disorders g. Cardiac masses: Normal variants, primary cardiac neoplasms and secondaries involving the heart, secondary effects, extra cardiac masses, intra cardiac thrombi, ultrasonic typing, manmade objects in the heart h. Electrophysiology: echo in bundle branch blocks and Wolf-Parkinson-White syndrome, Atrial fibrillation, ectopic rhythm-ventricular and supra-ventricular, pacemakers, CRT & ICD i. Use of TEE in intensive care setup	
Total		60 hrs

MCCT 108 P- Echocardiography- Advanced

Sr. No.	Topics	No. of Hrs.
1	i. Linear measurements: indirect M-Mode markers of leftventricular function. i. Assessing global LV function. ii. Regional left ventricular function: wall motion scoring, relationship to vascular supply, use of tissue Doppler where indicated. iii. 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. iv. Complications of IHD such as aneurysms, VSD, clots & MR especially from a surgical perspective.	40

2	Intensive care setup, protocols to follow in emergency situations & CPR, IV line insertion	20
3	Administrative issues – maintenance of quality & standards in hospitals, record maintenance, stocks & purchase, medico legal issues	20
4	How to prepare a report in various procedure - Routine trans-thoracic echo: adult and congenital/pediatric, TEE, contrast echo, vascular study & advanced echo	20
5	Archiving of clinical data and images & research: Basics	20
Total		120 hrs

Recommended Learning Resources:

Text 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)
5. Journal articles Cardiology by Braunwald (Twelvth edition)and Hurst (Sixteenth edition)
6. Echo made easy by Sam Kaudora

Name of the Programme	M.Sc. Interventional Technology
Name of the Course	Quality Assurance, Standardization& Accreditation(Cardiac Care)

Teaching Objective	The course enables the students to understand the concept of quality, its dimensions, methodology to assess it, implement quality control, understand what is quality assurance and its process, healthcare audits, patients care, total quality management and continuous quality improvement as applicable to healthcare.
Learning Outcomes	- Students will learn the concept of Quality Assurance and its applications. - To understand, implement and follow standard methods of Quality Assurance

Sr. No.	Title	Details	No. of Hrs.
1	Concept of Quality	- Introduction - Quality management philosophies - The leading edge of the modern approach to quality in healthcare - Performance - Evaluation	15
2	Quality Indicators	Quality Audits of QC and calibration performed	10
3	Standardization of quality	- Quality Assurance in Medical Imaging: Implementation & operation ,Evaluation and implementation of AERB guidelines	10
4	Accreditation of Center	- Quality Accreditation in Echocardiography Laboratory - NABH Rules and Regulations - AERB Rules and Regulations - BARC Rules and Regulations - Joint Commission International(JCI)	15

5	Accreditation of Personnel	American registry, Canadian Registry, European Registry, Australian registry	10
Total			60 hrs

Recommended Learning Resources: Recommended textbooks:

1. Hospitals & Health service Accreditation –Principles & Practices S.A tatrish-2010 edition.

Reference books or related websites:

1. Quality Management in the Imaging Sciences Jeffrey Papp
2. Continuous Quality Improvement in Health Care, TheoryImplementationand applications : Second edition, Curtis P. McLaughlin, Arnold D. Kaluzny.

Additional readings: Details of journal/Magazine articles, Whitepapers, Case–Studies, Web-casts, Podcasts etc. supporting the topics of the course.

Name of the Programme	M.Sc. Interventional Technology
Name of the Course	DISSERTATION/PROJECT

***The Dissertation work will begin from First Year, and will continue through the Second Year.**

Name of the Programme	M.Sc. Interventional Technology
Name of the Course	Seminar

For Seminar/Presentations there will be a maximum of 50 marks. Seminar / presentations will be evaluated by the teachers of the dept. The marks obtained in the same will be kept confidentially with the Head of the Dept. and will be submitted along with the internal assessment marks.

SECOND YEAR

M.Sc. Interventional Cardiology

Core Subjects
Theory
General Elective**
Pursuit of Inner Self Excellence (POISE)
Bioethics, Biosafety , IPR & Technology transfer
Disaster Management and Mitigation Resources
Human Rights
Dissertation / Project
Practical
Educational Tour / Field Work/IV/Hospital Visit

*(a) **Dissertation / Project Course** commences in Second Year

(b) Educational Tour / Field Work/ IV/ Hospital Visit: Course may be carried out in any Semester or all Semesters but evaluated and Grade Points are to be added in Second Year.

(Elective): Any one subject is to be chosen from the following (Subjects offered may change from time to time depending on the availability of expertise)

**Elective courses may or may not have practical and/or field work.

▲ Multidisciplinary / Interdisciplinary

Educational Tour / Field Work/ IV/ Hospital Visit:

Industrial visit has its own importance in building a career of a student which is pursuing a professional degree. Objections of industrial visit are to provide students an insight regarding internal working of reputed hospitals and labs. Industrial visits provides students an opportunity to learn practically thoughts interactions, working methods and employment practices as theoretical knowledge is not enough for making a competent and skilful professionals.

ACADEMIC SYLLABUS

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	PURSUIT OF INNER SELF EXCELLENCE (POISE)

Course objective	1. To inculcate moral values in students – Self-Discipline , Time Management, Develop attitude of Service with humility, Empathy, Compassion, brotherhood, Respect for teachers, colleagues & society members. 2. Develop Effective means of communication & presentation skills in students 3. To develop wisdom in students for deciding their career based on their areas of interest and inner skills. 4. Introduce techniques for Relaxation, Meditation & Connecting with innerself. 5. Rejuvenation Techniques which can be used by students to distress themselves 6. To improve performance of students during various assignments, projects, elocutions, events, quiz, interviews.
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Course outcomes	1. Students will become self dependent, more decisive and develop intuitive ability for their study and career related matter. 2. Students ability to present their ideas will be developed. 3. Enhanced communication skills, public speaking & improved Presentation ability. 4. Students will be able to explore their inner potential and inner ability to become a successful researcher or technician & hence become more focused. 5. Students will observe significant reduction in stress level. 6. With the development of personal attributes like Empathy, Compassion, Service, Love & brotherhood , students will serve the society and industry in better way with teamwork and thus grow professionally.
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Unit no.	Topics	No. of Hrs
1	Spiritual Values for human excellence : The value of human integration; Compassion, universal love and brotherhood (Universal Prayer) ; Heart based living ; Silence and its values, Peace and non-violence in thought, word and deed ; Ancient treasure of values - Shatsampatti , Patanjali's Ashtanga Yoga , Vedic education - The role of the Acharya , values drawn from various cultures and religious practices - Ubuntu, Buddhism, etc.; Why spirituality? Concept – significance ; Thought culture	15
2	Ways and Means : Correlation between the values and the subjects ; Different teaching techniques to impart value education; Introduction to Brighter Minds initiative; Principles of Communication; Inspiration from the lives of Masters for spiritual values - Role of the living Master	15
3	Integrating spiritual values and life: Relevance of VBSE (Value Based Spiritual Education) in contemporary life ; Significant spiritual values ; Spiritual destiny ; Principles of Self-management; Designing destiny	15
4	Experiencing through the heart for self-transformation (Heartfulness Meditation): Who am I? ; Introduction to Relaxation; Why, what and how HFN Meditation?; Journal writing for Self-Observation ; Why, what and how HFN Rejuvenation (Cleaning)? ; Why, what and how HFN connect to Self (Prayer)?; Pursuit of inner self excellence ; Collective Consciousness-concept of <i>egregore effect</i> ;	15
Total		60hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	BIOETHICS, BIOSAFETY, IPR & TECHNOLOGY TRANSFER

Course objective	The students will gain structural knowledge on: 1. To list the routes of exposure for a pathogen to a human being . 2. To demonstrate and assess the proper use of PPE, best practices, biological containment, and be prepared to safely conduct research 3. To identify the role of the Biosafety Professional in Biomedical Research Laboratories 4. To appreciate the importance of assertion in interpersonal communication and be introduced to some key assertion strategies 5. To understand the interpersonal nature of giving feedback, receiving criticism and resolving conflicts. 6. To establish attentive listening as an assertion strategy
Course outcomes	Students will learn to: 1. Effectively manage the health and safety aspects of a biological laboratory. 2. Give reliable, professional and informed advice and information to colleagues and managers. 3. Help to ensure that their institution complies with relevant legislation, liaise effectively with enforcing authorities and be aware of the penalties for failing to comply. 4. Build a context of understanding through communication. 5. Mediate between other conflicting parties.

	6. Exhibit de-escalatory behaviors in situations of conflict. 7. Demonstrate acknowledgment and validation of the feelings, opinions, and contributions of others.
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Unit no.	Topics	No of Hrs
1	Ethics: Benefits of Allied Health Sciences, ELSI of Bioscience, recombinant therapeutic products for human health care, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetic rDNA research, human embryonic stem cell research.	15
2	Patenting: Patent and Trademark, Bioscience products and processes, Intellectual property rights, Plant breeders rights, trademarks, industrial designs, copyright biotechnology in developing countries. Biosafety and its implementation, Quality <i>control in</i> Biotechnology.	15
	Introduction to quality assurance, accreditation & SOP writing : Concept of ISO standards and certification , National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clonical and testing laboratory.	15
3	Funding Agencies (Financing alternatives, VC funding, funding for Bioscience in India, Existstrategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio- entrepreneurship efforts in India, difficulties in India experienced, organizations supporting growth, areas of scope, funding agencies in India, policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and up gradation)	15
Total		60hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	DISASTER MANAGEMENT AND MITIGATION RESOURCES

Course objective	The course will uplift about: 1. Understand and appreciate the specific contributions of the Red Cross/Red Crescent movement to the practice and conceptual understanding of disaster management and humanitarian response and their significance in the current context. 2. Recognize issues, debates and challenges arising from the nexus between paradigm of development and disasters. 3. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. 4. Respond to disaster risk reduction initiatives and disasters in an effective, humane and sustainable manner.
Course outcomes	At the successful completion of course the student will gain: 1. knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences. 2. Knowledge and understanding of the International Strategy for Disaster Reduction (UN-ISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy. 3. Ensure skills and abilities to analyse potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects.

Unit no.	Topics	No of Hrs.
1	Introduction: Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	08
2	Natural Disaster and Manmade disasters: Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	15
3	Disaster Management, Policy and Administration: Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	12
4	Financing Relief Measures: Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events.	13
5	Preventive and Mitigation Measures: Pre-disaster, during disaster and post-disaster measures in some events in general structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	12
Total		60hrs

Reference Books:

1. Shailendra K.Singh : Safety & Risk Management, Mittal Publishers

2. J.H.Diwan : Safety, Security & Risk Management, APH
3. Stephen Ayers & Garmvik: Text Book of Critical Care, Holbook and Shoemaker
4. www.pdfdrive.net
5. www.khanacademy.org
6. www.acadeicearths.org
7. www.edx.org
8. www.open2study.com
9. www.academicjournals.org

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	HUMAN RIGHTS

Course objective	Students will comprehend on: 1. A branch of public international law, and relevant juridical mechanisms at global as well as regional levels, 2. Human rights as an object of study in history, philosophy and the social sciences, as well as a practical reality in national and international politics. 3. Different forms of promoting and implementing human rights, domestically as well as on the international level. 4. The role of human rights in contemporary issues relating to terrorism, religion, ethnicity, gender and development. 5. Cholarly values such as transparency, impartiality, clarity, reliance and the importance of sound reasoning and empirical inference.
Course outcomes	Student will be able to virtue: 1. identify, contextualise and use information about the human rights situation in a given country 2. critically appraise source material, including cases from human rights committees and tribunals and reports and summary records from treaty bodies 3. analyse a country's situation or an international situation in terms of human rights and formulate human rights-based initiatives and policies 4. Promote human rights through legal as well as non-legal means. 5. Participate in legal, political and other debates involving human rights in a knowledgeable and constructive way

Unit no.	Topics	No. of Hrs
1	<i>Background:</i> Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights	08
2	<i>Human rights at various level :</i> Human Rights at Global Level UNO, Human Rights – UDHR 1948 – UN Conventions on Human Rights: International Covenant on civil and Political Rights 1966, International Convent on Economic, Social and Cultural Right, Racial Discrimination -1966 International, Instruments: U.N. Commission for Human Rights, European Convention on Human Rights.	15
3	<i>Human rights in India :</i> Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman	12
4	<i>Human Rights Violations:</i> Human Rights Violations against Women, Human Rights Violations against Children, 35 Human Rights Violations against Minorities SC/ST and Trans-genders, Preventive Measures.	13
5	<i>Political issues:</i> Political Economic and Health Issues, Poverty, Unemployment, Corruption and Human Rights, Terrorism and Human Rights, Environment and Human Rights, Health and Human Rights	12
Total		60hrs

Reference Books:

1. Jagannath Mohanty Teaching of Humans Rights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi 2009
2. Ram Ahuja: Violence Against Women Rawat Publications Jewahar Nager Jaipur. 1998.
3. Sivagami Parmasivam Human Rights Salem 2008
4. Hingorani R.C.: Human Rights in India: Oxford and IBA New Delhi.

Name of the Programme	M.Sc. Interventional Cardiology
Name of the Course	DISSERTATION / PROJECT WORK

1. Dissertation/Project work should be carried out as an individual Dissertation and actual bench work.
2. The students will carry independent project work under the supervision of the staff of Department on an advanced topic assigned to him/her. In house projects are encouraged. Students may be allowed to carry out the project work in other Departmental laboratories /Research institutes /Industries as per the availability of Infrastructure.
3. Co guides from the other institutions may be allowed.
4. The Dissertation/Project work will begin from 3rd Semester, and will continue through the 4th Semester.
5. The Dissertation/Project report (also work book shall be presented at the time of presentation and viva voce) will be submitted at the end of the 4th Semester and evaluated.
6. Five copies of the project report shall be submitted to the Director, SBS.
7. For the conduct of the End Semester Examination and evaluation of Dissertation/Project work the University will appoint External Examiners.
8. Since the dissertation is by research, Dissertation/Project work carries a total of 250 marks and evaluation will be carried out by both internal and external evaluators.
9. The student has to defend his/her Dissertation/Project Work in a seminar which will be evaluated by a internal and external experts appointed by the University.

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 attached

The learning out comes to be assessed should include:

- **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)
- **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)
- **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,)
- **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.
- **Records:** Records, log books and marks obtained in tests will be maintained by the Head of the Department.

Checklist - I

Model Checklist for Evaluation of Journal Review Presentations Name of the student: _____ Date: _

Name of the Faculty/ Observer: _____

S No.	Items for observation during presentation		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 Checklist for Evaluation of the Seminar Presentations Name of the student: _____ Date: ____

Name of the Faculty/ Observer: ____

S No.	Items for observation during presentation		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 Checklist for Evaluation of Teaching Skill

Name of the student: _____ Date: ____

Name of the Faculty/ Observer: _____

S. 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		