



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2025-26 Batches)

Curriculum for M.Sc. Cardiac Care Technology

Amended as per AC-51/2025, Dated 29/04/2025

Amended History

1. Amended as per AC-51/2025, [Resolution No.3.1(Annexure-3.8)], [Resolution No.3.5, (Annexure-7);
Dated 29/04/2025.

Resolution No. 3.1 of Academic Council (AC-51/2025):

Resolved to approve the CBCS syllabus, including Program Outcomes (POs), Course Outcomes (COs), and PO-CO Mapping for 15 two-year postgraduate programs under MGMSBS for Semesters I and II. These include : M.Sc. Medical Biotechnology , M.Sc. Medical Genetics , M.Sc. Clinical Embryology, M.Sc. Clinical Nutrition, M.Sc. Medical Dialysis Technology, M.Sc. Molecular Biology, M.Sc. Medical Radiology & Imaging Technology , **M.Sc. Cardiac Care Technology** , M.Sc. Operation Theatre and Anaesthesia Technology, M.Sc. Emergency and Trauma Care, M. Optometry, Master in Hospital Administration, Master of Public Health, M.Sc. Health Informatics & M.Sc. Clinical Research to be effective from batch admitted in Academic Year 2025-26 onwards [ANNEXURE-3.1 to 3.30].

Annexure-3.8 of AC-51/2025

**MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI**
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade “A⁺⁺” Accredited by NAAC

Sector 1, Kamothe Navi Mumbai-410209, Tel.No.022-27437631, 27437632

Email. sbsnm@mgmuhs.com / Website: www.mgmsbsnm.edu.in**CHOICE BASED CREDIT SYSTEM (CBCS)****(Academic Year 2025 - 26)****Curriculum for****M.Sc. Allied Health Sciences****M.Sc. Cardiac Care Technology****Semester I & II**

DIRECTOR'S MESSAGE

Welcome Message from the Director

Dear Postgraduate Students,

Welcome to **MGM School of Biomedical Sciences (MGMSBS)**, **MGMIHS**, a premier institution dedicated to advancing allied and health sciences education. As you embark on this transformative academic journey, you are joining a community that fosters excellence in research, clinical expertise, and innovation.

MGMIHS, accredited with NAAC 'A⁺⁺' Grade (CGPA 3.55, 2022) and recognized as a **Category I Institution by UGC**, offers an ecosystem that nurtures both academic and professional growth. With **NIRF (151-200 rank band) recognition**, **NABH-accredited hospitals**, **NABL-accredited diagnostic labs**, and **JCI accreditation for MGM New Bombay Hospital**, we uphold global benchmarks in education and healthcare.

At MGMSBS, our **15 postgraduate programs** are meticulously designed to align with the National Commission for Allied and Healthcare Professionals (**NCAHP**) standards, National Education Policy (**NEP**) 2020, and the National Credit Framework (**NCrF**). We have implemented the **Choice-Based Credit System (CBCS)** to provide academic flexibility while ensuring rigorous training in clinical and technical skills. Our state-of-the-art research laboratories, digital classrooms, and the Central Research Laboratory (CRL) foster an environment that encourages innovation and evidence-based learning.

Postgraduate education at MGMSBS goes beyond theoretical learning—our curriculum integrates **hands-on clinical training, interdisciplinary collaboration, and exposure to real-world healthcare challenges**. We emphasize **research-driven education**, encouraging students to actively participate in **scientific discoveries, publications, and international collaborations**.

Beyond academics, we believe in **holistic development**, with initiatives such as the **AARAMBH Science and Wellness Club**, which promotes **mental well-being, leadership, and professional networking**.

As you step into this **next phase of academic and professional growth**, we encourage you to explore new ideas, engage in impactful research, and contribute meaningfully to the **healthcare ecosystem**. We are confident that your journey at MGMSBS will shape you into **skilled, compassionate, and visionary professionals**, ready to lead in the ever-evolving healthcare landscape.

We look forward to witnessing your achievements and contributions!

Dr. Mansee Thakur

Director, MGM School of Biomedical Sciences
MGM Institute of Health Sciences, Navi Mumbai

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences through meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGM IHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well-equipped labs. The school encompasses 23 courses each with its own distinct, specialized body of knowledge and skill. This includes 8 UG courses and 15 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately **800** at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reforms are essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Name of the Degree: M.Sc. Cardiac Care Technology

Duration of Study:

The duration of the study for M.Sc. Cardiac Care Technology will be of 2 years.

Eligibility Criteria:

B.Sc. Cardiac Care/Cardiovascular Technology OR 2 years of Diploma in Cardiovascular Technology (post regular general B.Sc.) with minimum of 3 year experience.

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

For any query visit the website: www.mgmsbsnm.edu.in

M.Sc. CARDIAC CARE TECHNOLOGY

Program Outcome

Program Code	Program Objective
PO1	Knowledge and skill: Nurture the scientific and/or clinical knowledge and skills for development of industrial applications, health care practices and entrepreneurship.
PO2	Critical Thinking & problem solving: Develop the ability of critical thinking to analyse, interpret problems and to find out systematic approach for solution.
PO3	Decision making: Impart decision making capability for handling various circumstances in their respective areas
PO4	Research skill: Demonstrate research skills for planning, designing, implementation and effective utilization of research findings for community.
PO5	Individual and team work: Develop an ability to function as an efficient individual and team player in multidisciplinary sectors for effective outcomes
PO6	Communication skills: Demonstrate effective written and oral communication skills to communicate effectively in health care sector, industries, Academia and research.
PO7	Code of ethics: Inculcate code of ethics in professional and social circumstances to execute them in daily practices and research in respective areas of specialization
PO8	Lifelong learning: Develop lifelong learning attitude and values for enhancement of professional and social skills for an overall development

Program Specific Outcome

Program Code	Program Objective
SPO1	The course aims to provide students with the requisite clinical assessment, decision-making skills and management for a range of cardiology conditions and stroke including pharmacological and non-pharmacological therapeutic interventions.
SPO2	This course offers the opportunity to study all aspects of clinical cardiology including expert assessment and management of a range of cardiac conditions, cardiac interventions, interpretation and practical skills.
SPO3	Includes hyper acute stroke, thrombolysis, interpretation of cardiac CT and MRI, TIA management, maximising stroke care, rehabilitation and long term.
SPO4	The programme can be regarded as vital training for the early stages of cardiology or stroke specialist training with clear learning objectives.

COURSE OUTCOME

SEMESTER –I

MCCT 101 T & MCCT 104 P	Introduction to Clinical Cardiology	Mapped POs	Teaching- Learning Methodologies	Assessment Tools
CO1	Student should Understand the Anatomy & Physiology of the Heart: Describe the structure, function, and conduction system of the heart. Identify common symptoms and examination techniques for cardiovascular diseases.	PO1-PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Cardiovascular Examination Techniques Students should Assess general and detailed physical appearance for signs of heart disease. Examine arterial pulses, jugular veins, and peripheral veins for diagnostic insights. Measure blood pressure and evaluate its physical determinants.	PO1-PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Students Analyze Cardiovascular Diagnostic Tests: Interpret ECG, echocardiography, cardiac catheterization, and stress testing results. Use chest roentgenograms (X-rays) to assess cardiac conditions.	PO1-PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO4	To understand the role of Cardiac Care technologist while assisting the Cardiologist as well as when performing individually	PO1-PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MCCT 102 T & MCCT 105 P	Fundamentals of Cardiac Diagnostic Procedures and Investigations	Mapped POs	Teaching- Learning Methodologies	Assessment Tools
CO1	To educate and train students to understand, interpret and complex diagnostic cardiac investigations.	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Prepare for Emergencies in the Cardiac Cath Lab Identify major and minor complications during cardiac catheterization. Apply Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) algorithms in emergencies.	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment

MCCT 103 T	Introduction to Pacing and Electrophysiology Study Techniques	Mapped POs	Teaching- Learning Methodologies	Assessment Tools
CO1	Identify indications for cardiac pacing based on international guidelines	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
CO2	Identify indications for electrophysiological studies with/ without ablation in cases of complex arrhythmias.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
CO3	Develop Expertise in Cardiac Pacing & Pacemaker Therapy Describe normal cardiac conduction and the need for pacing. Interpret NBG codes for pacemakers and their application. Differentiate indications for temporary vs. permanent pacing. Understand the components and functioning of pacemakers.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
CC 001 T & CC 001 P	Research Methodology & Biostatistics (Core Course)	Mapped POs	Teaching- Learning Methodologies	Assessment Tools
CO1	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.	P1,P2,P4,P5, P6,P7,P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
MCCT 106 CP	MCCT Directed Clinical Education-I	Mapped POs	Teaching- Learning Methodologies	Assessment Tools
CO1	Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case- study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce
CO 2	Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case- study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce

CO 3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce
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SEMESTER-II

MCCT 107 T & MCCT 109 P	Introduction to Non-Invasive Techniques in Cardiology	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Identify indications for non-invasive techniques based on international guidelines.	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Develop Expertise in non-invasive techniques. ECG, Echocardiography, Stress Test,	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MCCT 108 T & MCCT 110 P	Invasive Cardiology	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	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	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	In-depth knowledge of cardiac diagnostic and interventional procedures, focusing on contrast media, intravascular imaging, coronary interventions, assist devices, peripheral angiography, and cardiac pharmacology.	P1-P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MCCT 111 CP	MCCT Directed Clinical Education-II	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Build a robust theoretical foundation, enabling students to understand health care practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce
CO 2	Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce

CO 3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.	P1-P8	Practical, Clinical Posting, Demonstration, Internship, Case-study, Clinical Simulation	Practical Exam, Station Exercise, Viva-voce
SEC 001 T	Innovation and Entrepreneurship	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.	P1,P2,P4,P5,P6,P7,P8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Experimental), Viva-Voice
SEC 002 T	One Health (NPTEL)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	A comprehensive understanding of One Health & role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Online NPTEL MCQ test
CO2	Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Online NPTEL MCQ test
CO3	Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.	P1-P8	Lecture, Demonstration, Practical, Assignment, Seminar	Online NPTEL MCQ test

OUTLINE OF COURSE CURRICULUM														
M.Sc.Cardiac Care Technology														
Semester I														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MCCT 101 T	Introduction to Clinical Cardiology	2	-	-	-	2	30	-	-	-	30	20	80	100
MCCT 102 T	Fundamentals of Cardiac Diagnostic Procedures and Investigations	2	-	-	-	2	30	-	-	-	30	20	80	100
MCCT 103 T	Introduction to Pacing and Electrophysiology Study Techniques	3	-	-	-	3	45	-	-	-	45	20	80	100
CC 001 T	Research Methodology & Biostatistics (Core Course)	3	-	-	-	3	45	-	-	-	45	-	50	50
Discipline Specific Core Practical														
MCCT 104 P	Introduction to Clinical Cardiology	-	-	4	-	2	-	-	60	-	60	10	40	50
MCCT 105 P	Fundamentals of Cardiac Diagnostic Procedures and Investigations	-	-	4	-	2	-	-	60	-	60	10	40	50
MCCT 106 CP	MCCT Directed Clinical Education-I	-	-	-	12	4	-	-	180	180	-	50	50	
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	-	50	50
Total		10	0	12	12	20	150	0	180	180	510	80	470	550

OUTLINE OF COURSE CURRICULUM														
M.Sc.Cardiac Care Technology														
Semester II														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MCCT 107 T	Introduction to Non-Invasive Techniques in Cardiology	4	-	-	-	4	60	-	-	-	60	20	80	100
MCCT 108 T	Invasive Cardiology	4	-	-	-	4	60	-	-	-	60	20	80	100
Discipline Specific Core Practical														
MCCT 109 P	Introduction to Non-Invasive Techniques in Cardiology	-	-	4	-	2	-	-	60	-	60	10	40	50
MCCT 110 P	Invasive Cardiology	-	-	4	-	2	-	-	60	-	60	10	40	50
MCCT 111 CP	MCCT Directed Clinical Education-II	-	-	-	15	5	-	-	-	225	225	-	50	50
Skill Enhancement Course														
SEC 001 T	Innovation and Entrepreneurship	3	-	-	-	3	45	-	-	-	45	-	100	100
SEC 002 T	One Health (NPTEL)													
Total		11	0	8	15	20	165	0	120	225	510	60	390	450

FIRST YEAR

M.Sc. Cardiac Care Technology

SEMESTER-I

Code No.	Core Subjects
Discipline Specific Core Theory	
MCCT 101 T	Introduction to Clinical Cardiology
MCCT 102 T	Fundamentals of Cardiac Diagnostic Procedures and Investigations
MCCT 103 T	Introduction to Pacing and Electrophysiology Study Techniques
CC 001 T	Research Methodology & Biostatistics (Core Course)
Discipline Specific Core Practical	
MCCT 104 P	Introduction to Clinical Cardiology
MCCT 105 P	Fundamentals of Cardiac Diagnostic Procedures and Investigations
MCCT 106 CP	MCCT Directed Clinical Education-I
CC 001 P	Research Methodology & Biostatistics (Core Course)

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester I
Name of the Course	Introduction to Clinical Cardiology
Course Code	MCCT 101 T

Teaching Objective	<ul style="list-style-type: none"> To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography. To provide practically and clinically useful application of Echocardiography. To explain echo techniques available and to put echo into a clinical perspective.
Course Outcomes	<ul style="list-style-type: none"> Student should understand the Anatomy & Physiology of the Heart: Describe the structure, function, and conduction system of the heart. Identify common symptoms and examination techniques for cardiovascular diseases. Cardiovascular Examination Techniques: Students should assess general and detailed physical appearance for signs of heart disease. Examine arterial pulses, jugular veins, and peripheral veins for diagnostic insights. Measure blood pressure and evaluate its physical determinants. Students Analyze Cardiovascular Diagnostic Tests: Interpret ECG, echocardiography, cardiac catheterization, and stress testing results. Use chest roentgenograms (X-rays) to assess cardiac conditions. To understand the role of Cardiac Care technologist while assisting the Cardiologist as well as when performing individually.

Sr. No.	Topics	No. of Hrs.
1	Basic Cardiology: Anatomy of the heart, Conduction system of the heart, Symptoms of the heart diseases, Examination of Cardiovascular diseases	4
2	Cardiac Auscultation: The stethoscope: components, working, uses, Heart sound – Types of heart sounds: normal and abnormal, Prosthetic heart sounds	4
3	Physical Appearance: General appearance, Gestures and gait Detailed Appearance: Face, Eyes—external and internal Mouth—external and internal Hands and feet, Skin, Muscles and tendons, Thorax, Abdomen	5
4	Arterial pulse: Information derived from the arterial pulse, Sites of Arterial Pulse, Methods of measuring Arterial pressure, Physical determinants of Arterial pressure The Jugular and Peripheral Veins: External and Internal Jugular Veins, Techniques of Examination for External and Internal Jugular Veins, Assessment of Jugular Venous Pressure, Anatomic-Hemodynamic Inferences, Electrophysiologic Inferences—Arrhythmias and Conduction Defects	5
5	Investigations in Cardiology: Chest roentgenogram, Electrocardiography, Echocardiography, Cardiac catheterization, Exercise stress testing.	4
6	Heart failure & Cardiomyopathy: Heart failure, Cardiogenic shock, Pulmonary edema, Cardiomyopathy	4

7	Cardiovascular diseases: Hypertension, Ischemic Heart disease, Rheumatic heart disease, Arrhythmias, Pregnancy and heart diseases	4
Total		30 hrs

MCCT 104 P- Introduction to Clinical Cardiology

Sr. No.	Topics	No. of Hrs.
1	Cardiac Auscultation	15
2	Physical Examination in Cardiovascular diseases	15
3	Chest roentgenogram	15
4	Electrocardiography	15
Total		60 hrs

Recommended Learning Resources:

Text Books:

1. Physical Examination of the Heart and Circulation Fourth Edition, Joseph K. Perloff, M.D.
2. Textbook of Anatomy (Vol.1,2,3): B.D. Chaurasia
3. Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waugh and Allison Grant
4. Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora & Bryan Derrickson
5. Textbook of Physiology (Vol.1,2): Dr. A.K. Jain

Reference books or related websites: www.osmosis.org

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester I
Name of the Course	Fundamentals of Cardiac Diagnostic Procedures and Investigations
Course Code	MCCT 102 T

Teaching Objective	<ul style="list-style-type: none"> This course provides a basis for the student to develop a systematic and comprehensive understanding of, and skills in, cardiac investigations and diagnostic procedures
Course Outcomes	<ul style="list-style-type: none"> To educate and train students to understand, interpret and complex diagnostic cardiac investigations. Prepare for Emergencies in the Cardiac Cath Lab: Identify major and minor complications during cardiac catheterization. Apply Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) algorithms in emergencies.

Sr. No.	Topics	No. of Hrs.
1	Cardiac Catheterization in detail: Types of procedures, Hardware used, Vascular access, Conditions for Cardiac Catheterization	6
2	Physics and Operation of Radiation equipment in Cardiac Cath Lab: X-RAY tube & its design, Image intensifier, Gantry, Exposure factors, Projections used in various procedures	6
3	Diagnostic Procedures: Coronary Angiography, Peripheral Angiography, Renal Angiography, Cerebral Angiography	6
4	HEMODYNAMICS: Introduction to Hemodynamics, Pressure Measurement System, Sources of Error and Artifacts: Fluid Artifacts, Electronic and Electrical Artifacts, Human Error: Leveling and Balancing, Slope calibration, Hemodynamic waveforms, Gradient, Valve Area Calculations, Cardiac output formulas- Fick, Ejection fraction	6
5	Emergencies in the Cardiac Catheterization Laboratory: Major and Minor complications in CCL, Basic Life support and ACLS algorithms in emergencies	6
Total		30 hrs

MCCT 105 P- Fundamentals of Cardiac Diagnostic Procedures and Investigations

Sr. No.	Topics	No. of Hrs.
1	Cardiac Catheterization	10
2	Angiography& its types	10
3	Hemodynamic assessment	10
4	BLS & ACLS algorithm	10
5	Physics of Radiation Equipment	10
6	Hardwares used in CCL	10
Total		60 hrs

Recommended Learning Resources:

Text Books:

1. Invasive Cardiology- A MANUAL FOR CATH LAB PERSONNEL, 3rd Edition by Sandy Watson

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester I
Name of the Course	Introduction to Pacing and Electrophysiology Study Techniques
Course Code	MCCT 103 T

Teaching Objective	<ul style="list-style-type: none"> To teach students about common pacemaker problems Identify indications for ICD and biventricular pacemaker implantation based on international guidelines
Course Outcomes	<ul style="list-style-type: none"> Identify indications for cardiac pacing based on international guidelines Identify indications for electrophysiological studies with/ without ablation in cases of complex arrhythmias. Develop Expertise in Cardiac Pacing & Pacemaker Therapy Describe normal cardiac conduction and the need for pacing. Interpret NBG codes for pacemakers and their application. Differentiate indications for temporary vs. permanent pacing. Understand the components and functioning of pacemakers.

Sr. No.	Topics	No. of Hrs.
1.	Anatomy of conduction system: SA node, AV node, Intermodal and inter-atrial conduction, AV junctional and inter-ventricular conduction delay, The bundle of His, penetrating portion of the AV bundle, The bundle branches, The branching portion of the AV bundle, Terminal Purkinje fibers, Innervations of the AV node, His bundle & ventricular myocardium	8
2.	Nervous & hormonal control of heart: Anatomy of ANS, Various hormones involved in control of heart, Effect of vagal stimulation, Effect of sympathetic stimulation	8
3.	Basics of Electrophysiology: History, Equipment used, Personnel, Procedure, Arrhythmias treated, Differences Between Children and Adults for Electrophysiology	7
4.	Radiofrequency ablation therapy: Procedure, Arrhythmias treated: Atrioventricular Nodal Reentrant Tachycardia (AVNRT), Atrial Fibrillation, Atrial Flutter and Ventricular Tachycardia	7
5.	Introduction to Cardiac Pacing: Normal conduction, NBG codes for pacemaker, Indications for Temporary and Permanent Pacing, Pacemaker Components	7
6.	Temporary Pacing (in detail): Myocardial conduction, Pacemaker therapy, Basic terminologies used in Temporary Pacing, Types of Temporary pacemaker, Complications associated	8
Total		45 hrs

Recommended Learning Resources:**Text Books:**

- Invasive Cardiology- A MANUAL FOR CATH LAB PERSONNEL, 3rd Edition by Sandy Watson
- Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora& Bryan Derrickson

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester I
Name of the Subject	Research Methodology & Biostatistics (Core Course)
Subject Code	CC 001 T

Teaching Objective	<ul style="list-style-type: none"> 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, analyze the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Course Outcomes	<ul style="list-style-type: none"> 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	Topic	No. of Hrs.
A	Research Methodology:	23
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	4
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.	5
3	Sampling Designs: Census and Sample Survey, Need and importance for Sampling, Implications of a Sample Design, Different Types of Sample Designs (Probability sampling and non-probability sampling), Systematic sampling, Stratified sampling, Cluster sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	Measurement in research: Measurement Scales, Sources of Error in Measurement,	3
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method	4
6	Research Ethics and plagiarism	2
B	Biostatistics	22
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, 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, power of test, Normal distribution, Parametric Tests including Z-test, t-test, and ANOVA	4
10	Chi-square Test: Chi-square as a Non-parametric Test, Applications.	2
11	Measures of Relationship: Correlation and Simple Regression Analysis	3
12	Non-parametric test: Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test, Kruskal Walli's test, Friedman's test, and Spearman Rank correlation test.	3
13	Vital Health Statistics: rate, crude rate, age specific rate, Measurement of fertility, Rate, Measures of mortality.	4
Total		45 hrs

CC 001 P–Research Methodology & Biostatistics (Core Course)

Sr. No.	Topics	No. of Hrs.
A	Research Methodology	
1	Research Article Presentation (Seminar)	5
B	Biostatistics	
2	Data Presentation	4
3	Measures of Central Tendency and Dispersion	6
4	Testing of Hypotheses	16
5	Chi-square Test	4
6	Measures of Relationship	6
7	Analysis of Variance	5
8	Non parametric or Distribution-free Tests	8
9	Computer Application Using Statistical Software including SPSS	6
Total		60 hrs

Reference Books:

1. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. 10th ed. Wiley; 2013.
2. Gupta SC, Kapoor VK. Fundamentals of mathematical statistics. Sultan Chand & Sons; 2020 Sep.
3. Kothari CR, Garg G. Research methodology: Methods and techniques. 2019.
4. Mahajan BK. Methods in biostatistics for medical students and research workers. 7th ed. Jaypee Brothers Medical Publishers; 2010.
5. Murthy MN. Sampling theory and methods. Statistical Publishing Society; 1967.
6. Singh YK. Fundamental of research methodology and statistics. New Age International; 2006.

Resolution No. 3.5 of Academic Council (AC-51/2025):

Resolved to approve the submitted list of recommended books for M.Sc. Clinical Nutrition and the course on **Biostatistics and Research Methodology** [ANNEXURE-7].

Annexure-7 of AC-51/2025

Biostatistics & Research Methodology Books List

Subject	Book Name	Author
Biostatistics & Research Methodology	Biostatistics: A Foundation for Analysis in the Health Sciences (10th ed.)	Daniel WW.
	Biostatistical Analysis (5th ed.)	Zar JH.
	Research Methodology: Methods and Techniques	Kothari CR, Garg G.
	Methods in Biostatistics for Medical Students and Research Workers (7th ed.)	Mahajan BK.
	Sampling Theory and Methods	Murthy MN.
	Fundamentals of Research Methodology and Statistics	Singh YK.
	Fundamentals of Biostatistics (8th ed.)	Rosner B.
	An Introduction to Medical Statistics (4th ed.)	Bland M.

Course code- MCCT 106 CP: MCCT Directed Clinical Education – I

Course Outcomes	<ul style="list-style-type: none">• Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.• Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.• Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.
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Students will gain additional skills in interventional procedures, cardiac pharmacology and recent advancements. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate pharmacological and invasive techniques.
(Total-180 hrs.)

FIRST YEAR

M.Sc. Cardiac Care Technology

SEMESTER-II

Code No.	Core Subjects
Discipline Specific Core Theory	
MCCT 107 T	Introduction to Non-Invasive Techniques in Cardiology
MCCT 108 T	Invasive Cardiology
Discipline Specific Core Practical	
MCCT 109 P	Introduction to Non-Invasive Techniques in Cardiology
MCCT 110 P	Invasive Cardiology
MCCT 111 CP	MCCT Directed Clinical Education-II
Skill Enhancement Course	
SEC 001 T	Innovation and Entrepreneurship
SEC 002 T	One Health (NPTEL)

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester II
Name of the Course	Introduction to Non-Invasive Techniques in Cardiology
Course Code	MCCT 107 T

Teaching Objective	<ul style="list-style-type: none"> To teach students about common non-invasive techniques, investigations carried out with indications and complications
Course Outcomes	<ul style="list-style-type: none"> Identify indications for non-invasive techniques based on international guidelines Develop Expertise in non-invasive techniques. ECG, Echocardiography, Stress Test,

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 Wisdom 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

MCCT 109 P- 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 Echocardiography Tajik Jamil for Echocardiography.

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester II
Name of the Course	Invasive Cardiology
Course Code	MCCT 108 T

Teaching Objective	<ul style="list-style-type: none"> 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.
Course Outcomes	<ul style="list-style-type: none"> 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 In-depth knowledge of cardiac diagnostic and interventional procedures, focusing on contrast media, intravascular imaging, coronary interventions, assist devices, peripheral angiography, and cardiac pharmacology.

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

MCCT 110 P- 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, 3rd Edition by Sandy Watson.

Reference books or related websites:

1. THE INTERVENTIONAL CARDIAC CATHETERIZATION HANDBOOK, 3rd Edition by Morton J. Kern

Course code- MCCT 111 CP: MCCT Directed Clinical Education – II

Course Outcomes	<ul style="list-style-type: none">• Build a robust theoretical foundation, enabling students to understand healthcare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.• Emphasize hands-on training, ensuring proficiency in clinical procedures, diagnostic techniques, and the use of advanced medical equipment. This practical exposure will bridge the gap between theory and practice, enhancing students' confidence and competence in delivering quality patient care.• Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.
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Students will gain additional skills in interventional procedures, cardiac pharmacology and recent advancements. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate pharmacological and invasive techniques. **(Total- 225 hrs.)**

SKILL ENHANCEMENT COURSES

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester II
Name of the Subject	Innovation and Entrepreneurship
Subject Code	SEC 001 T

Course Outcome	<ul style="list-style-type: none"> • Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs. • Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures. • Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.
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Sr. No.	Topics	No. of Hrs.
1	Innovation and Innovation Eco-System, The Policy Framework, Startup Landscape and Innovation Hubs, - Digital India and Make in India, - Linking Innovation with Intellectual Property Rights, Raising Finance for Startups in India, Innovation in Indian Context, Writing a business plan	15
2	Creativity and Research, Converting Researches to Innovation: Innovation Types and Models, Product Development, IPR and its Commercialisation, Support System to Develop Culture of Research and Innovation, Commercialisation of research and innovation, Fund raising – Research and Innovation, Envisioning Innovation and Scenario Building	15
3	Introduction to Innovation in Entrepreneurship, Idea Generation and Validation, Design Thinking in Entrepreneurship, Business Model Innovation, Technology and Innovation, Funding Innovation, Entrepreneurial Mindset, Leadership & amp; Intellectual Property, Scaling and Growth Strategies, sustainability & amp; Social Innovation	15
Total		45 hrs

Name of the Program	M.Sc. Cardiac Care Technology
Semester	Semester II
Name of the Subject	One Health (NPTEL)
Subject Code	SEC 002 T

Course Outcomes	<ul style="list-style-type: none"> • A comprehensive understanding of One Health's role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health. • Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases. • Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.
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Sr. No.	Topics	No. of Hrs.
1	Introduction to One Health : <ul style="list-style-type: none"> • Introduction to the One Health One Medicine Concept and National & International health/public health agencies • Global Health vs One Health • Basics of Research Ethics • Integrated human and animal disease surveillance systems • Recent success of One Health in control of emerging infectious diseases and the application of One Health in the control of endemic zoonoses in resource-poor communities 	5
2	Emerging Infectious Diseases and Antimicrobial Resistance: <ul style="list-style-type: none"> • Emerging infectious diseases • Process of disease emergence and assessment of the risk factors • Mechanisms of pathogen cross over across species boundaries and emerging infectious disease transmission, and its relevance in the 21st century • Importance of disease detection, Identification and monitoring in public health and the gaps in current health systems approaches and importance of Genome Sequencing • Introduction to disease vectors and basics of Medical Entomology • The factors influencing an emerging disease (whether is controlled or becomes endemic/epidemic as illustrated by different emerging diseases -STDs, HIV/AIDS, avian influenza, SARS, Ebola) • Antimicrobial resistance a global threat and Importance of antibiotic stewardship program • Introduction of Food Safety and Food Borne Diseases 	10
3	One Health Application in Management of Zoonotic Diseases: <ul style="list-style-type: none"> • What are zoonotic diseases & its role in our changing world • Understanding of bacterial, viral and parasitic zoonotic diseases; critical evaluation of its control measures, awareness of local, national and global factors and Influences 	10

	<ul style="list-style-type: none"> • Biogeography of zoonosis • The integration of human, animal and ecosystem health in the control and prevention of these diseases • Community engagement for zoonotic disease control in humans and animals through One Health 	
4	Applied Epidemiology & Public Health in One Health Research: <ul style="list-style-type: none"> • Basics of Epidemiological Studies • Rapid Response system, Disaster Management and Outbreak Investigation Plans • Basic statistical methods and their application and the measurement of disease frequency • Principles of survey design and the concepts of sampling • Mixed method research 	5
5	One Health and Health Policy: <ul style="list-style-type: none"> • Introduction to health policy • Political and institutional challenges in implementing One Health and the importance of a unified policy to address the shared health threats of humans and animals 	5
6	Media & Community engagement for One Health: <ul style="list-style-type: none"> • Risk Communication and Pandemic Preparedness • How ICMR and other Public Health Institutes tackled and managed pandemic situation in the country • Role of community in disease control & ways for community engagement • Uses of different types of media for communication and impact of the media on public attitudes to disease 	10
Total		45 hrs

***Note:** Attain the NPTEL Course with title and course code as “**One Health (Course Code: noc25-ge25) (NPTEL)**”

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		Marks distribution	Marks allotted per section	Marks
Sec: A	MCQ	10 x 1 M = 10	10	10
Sec: B	SAQ	3/4x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4x 5 M = 15	15	35
Sec: C	LAQ	2/3x 10 M = 10	20	
Total				80 Marks

Marks Scheme for the University Examination (50 Marks)

Final theory marks will be 50 marks University Theory exam pattern Research Methodology & Biostatistics (Core course)

Question	Question No.	Question Type	Marks Distribution	Marks
Sec: A	1.	LAQ (2 out of 3)	2 X 10 Marks = 20	20
Sec: B	2.	SAQ (6 out of 8)	6 X 05 Marks = 30	30
Total				50 Marks

Marks Scheme for the University Examination (100 Marks)

Final theory marks will be 100 marks University Theory exam pattern Elective Course

Question	Question No.	Question Type	Marks Distribution	Marks
Sec: A	1.	LAQ (10 out of 12)	10 X 10 Marks = 100	100
Total				100 Marks

Practical exam pattern: Total 40 marks with following breakup:

Exercise	Description	Marks
Q No 1	Practical exercise - 1	1 x15=15 M
Q No 2	Station exercise	2x5M=10 M
Q No 3	VIVA	10 M
Q No 4	Journal	5M
Total		40 Marks

Practical exam pattern Research Methodology & Biostatistics (Core course)**Total 50-mark distribution:**

Exercise	Description	Marks
Q No 1	Practical/Problem-Solving: These questions can assess statistical analysis, research design, hypothesis testing, or interpretation of data etc.	2 × 10 marks each) = 20 marks
Q No 2	Identification of study designs, Critical appraisal of research papers, Application of biostatistical tools, Sampling techniques etc.	(4 × 5 marks each) = 20 marks
Q No 3	Viva Voce (Oral Examination) Assessing conceptual clarity, application of research methodology, and statistical reasoning.	10 marks
Total		50 Marks

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	20 Marks

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
Total	20 Marks

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Model Checklist for Evaluation of the Clinical Directed Posting (PG)

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the Internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Core Competencies		
	Marks allotted	Marks obtained
Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.		
Clinical Teaching		
a. Demonstrate beginning competency in technical skills.	10	
Independent Work by Student guided by faculty		
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	2.5	
b. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	2.5	
Hands on practical work by students		
a. Protect confidentiality of electronic/manual health records data, information, and knowledge of technology in an ethical manner	05	
Independent work by student		
a. Demonstrate expected behaviors and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behavior and appearance.	05	
Log book	10	
Viva	10	
Attendance	05	
Total	50 Marks	

Sign of Internal Examiner: _____

Sign of External Examiner: _____



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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