Annexure-3.23 of AC-51/2025

PROGRAM OUTCOME (POs)	
Course Code	**M.Sc.CARDIAC CARE TECHNOLOGY**
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 an 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 inrespective areas of specialization
PO8	**Lifelong learning:** Develop lifelong learning attitude and values for enhancementof professional and social skills for an overall development
PROGRAM SPECIFIC OUTCOME (SPOs)	
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 Outcomes (COs)	
Course Code	**M.Sc.CARDIAC CARE TECHNOLOGY**
SEMESTER I	
MCCT 101 T	**Introduction to Clinical Cardiology**
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.
CO2	**Cardiovascular Examination Techniques** Stuents 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.
CO3	**Students Analyze Cardiovascular Diagnostic Tests:** Interpret ECG, echocardiography, cardiac catheterization, and stress testing results. Use chest roentgenograms (X-rays) to assess cardiac conditions.
CO4	To understand the role of Cardiac Care technologist while assisting the Cardiologist as well as when performing individually.
MCCT 102 T	**Fundamentals of Cardiac Diagnostic Procedures and Investigations**
CO1	To educate and train students to understand, interpret and complex diagnostic cardiac investigations.
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.
MCCT 103 T	**Introduction to Pacing and Electrophysiology Study Techniques**
CO1	Identify indications for cardiac pacing based on international guidelines
CO2	Identify indications for electrophysiological studies with/ without ablation in cases of complex arrhythmias.

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.
CC 001 T	**Research Methodology & Biostatistics (Core Course)**
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.
MCCT 106 CP	**MCCT Directed Clinical Education-I**
CO1	Build a robust theoretical foundation, enabling students to understand healthare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.
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.
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.
SEMESTER II	
MCCT 107 T	**Introduction to Non-Invasive Techniques in Cardiology**
CO1	Identify indications for non-invasive techniques based on international guidelines
CO2	Develop Expertise in non-invasive techniques.ECG,Echocardiography,Stess Test,
MCCT 108 T	**Invasive Cardiology**
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
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.
MCCT 111 CP	**MCCT Directed Clinical Education-II**
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.
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.
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.
SKILL EHANCEMENT COURSES	
SEC 001 T	**Innovation and Enterprenuarship**
CO1	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.
CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures.
CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.
SEC 002 T	**One Health (NPTEL)**
CO1	A comprehensive understanding of One Health & role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health.
CO2	Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases.
CO3	Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.

CO PO Mapping
Programe - M.Sc. Cardiac Care Technology
Semester I and II

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 an 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 inrespective areas of specialization
PO8 **Lifelong learning:** Develop lifelong learning attitude and values for enhancementof professional and social skills for an overall development

PO Mapping same with correlation level 3,2,1 The notation of 1 - low, 2 - moderate , 3 - high

Semester	Course / Course Code	Course Outcome	Course Outcome Detail	Knowledge and skill	Critical Thinking &problem solving	Decision making	Research skill	Individual and team work	Communication skills	Code of ethics	Lifelong learning
				PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8
Semester I	Introduction to Clinical Cardiology	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.	3	3	3	1	3	3	2	3
		CO2	**Cardiovascular Examination Techniques** Stuents 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.	3	2	3	1	3	3	2	3
		CO3	**Students Analyze Cardiovascular Diagnostic Tests:** Interpret ECG, echocardiography, cardiac catheterization, and stress testing results. Use chest roentgenograms (X-rays) to assess cardiac conditions.	3	3	3	1	3	3	2	3
		CO4	To understand the role of Cardiac Care technologist while assisting the Cardiologist as well as when performing individually.	3	3	3	2	3	3	3	3
	Fundamentals of Cardiac Diagnostic Procedures and Investigations	CO1	To educate and train students to understand, interpret and complex diagnostic cardiac investigations.	3	2	2	1	3	2	3	3
		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.	3	3	3	1	3	2	2	2
	Introduction to Pacing and Electrophysiology Study Techniques	CO1	Identify indications for cardiac pacing based on international guidelines	3	2	2	2	2	1	2	3
		CO2	Identify indications for electrophysiological studies with/ without ablation in cases of complex arrhythmias.	3	2	2	1	2	1	2	2

		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.	3	2	3	1	3	2	2	2
	Research Methodology & Biostatistics (Core Course)	**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.	2	2	0	3	2	1	1	3
	MCCT Directed Clinical Education-I	**CO1**	Build a robust theoretical foundation, enabling students to understand healthare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	3	3	2	1	3	3	3	3
		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.	3	3	3	1	3	3	3	3
		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.	3	3	3	1	3	3	3	3
Semester II	**Introduction to Non-Invasive Techniques in Cardiology**	**CO1**	Identify indications for non-invasive techniques based on international guidelines	2	2	1	1	2	2	2	3
		CO2	Develop Expertise in non-invasive techniques.ECG,Echocardiography,Stess Test,	3	3	3	1	3	3	3	3
	Invasive Cardiology	**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	2	2	3	1	2	3	3	2
		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.	3	3	3	2	3	3	3	3
	MCCT Directed Clinical Education-II	**CO1**	Build a robust theoretical foundation, enabling students to understand healthare practices, disease management, and patient care, thereby empowering them to make informed decisions and adapt to evolving medical technologies.	3	3	2	1	3	3	3	3
		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.	3	3	3	1	3	3	3	3
		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.	3	3	3	1	3	3	3	3

SKILL EHANCEMENT COURSES										
Innovation and Enterprenuarship	**CO1**	Students will grasp the concepts of innovation, its ecosystem, and the role of various stakeholders such as government policies, startups, and innovation hubs.	2	1	0	2	2	2	1	2
	CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures.	2	2	2	2	2	3	1	2
	CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.	2	3	2	2	2	2	1.0	2
One Health (NPTEL)	**CO1**	A comprehensive understanding of One Health & role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health.	2	2	2	3	2	3	2	2
	CO2	Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases.	2	2	2	3	2	3	2	2
	CO3	Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.	2	2	2	3	2	3	2	2

PROGRAM OUTCOME (POs)	Annexure-18H of AC-52/2025
Course Code	**M.Sc.CARDIAC CARE TECHNOLOGY**
PO1	**Knowledge and skill:** Demonstrate in-depth theoretical and practical knowledge of advanced echocardiography and cardiac catheterisation,congenital heart disease evaluation, quality standards, and research methodologies to provide comprehensive cardiac care.
PO2	**Critical Thinking & problem solving:** Apply analytical reasoning to interpret echocardiographic, hemodynamic, and quality-related data; identify clinical problems; and develop evidence-based solutions in both adult and pediatric cardiac care.
PO3	**Decision making**: Integrate diagnostic findings from echocardiography and cath lab with clinical presentations to assist in timely therapeutic, interventional, or surgical decision-making while considering patient safety and outcomes.
PO4	**Research skill:** Design and conduct independent research/dissertations, critically appraise scientific literature, and contribute to innovation, publications, and evidence-based practice in cardiac care technology.
PO5	**Individual and team work:** Collaborate effectively in multidisciplinary teams comprising cardiologists, pediatric cardiologists, surgeons, technologists, and researchers to ensure seamless patient-centered care.
PO6	**Communication skills:** Demonstrate professional communication by accurately documenting, presenting, and discussing findings with healthcare professionals, and by educating and counseling patients and families with empathy.
PO7	**Code of ethics:** Uphold ethical principles including patient confidentiality, integrity, radiation and procedural safety, adherence to accreditation standards, and compassionate care in both adult and pediatric contexts.
PO8	**Lifelong learning:** Commit to continuous self-learning and professional development by keeping pace with advances in interventional cardiology, echocardiographic imaging, accreditation standards, and research innovations.
PROGRAM SPECIFIC OUTCOME (SPOs)	
SPO1	Apply specialized knowledge and technical expertise in advanced echocardiography and cardiac catheterisation to accurately evaluate, assist, and support interventional and surgical management of adult, pediatric, and congenital heart diseases.
SPO2	Implement quality assurance, radiation safety, and accreditation standards in cardiac care settings, ensuring high standards of patient safety, procedural accuracy, and institutional compliance.
SPO3	Integrate clinical education, research, and innovation in cardiac care technology to train future professionals, contribute to evidence-based practice, and adapt to emerging technologies in cardiovascular medicine.
Course Outcomes (COs)	
Course Code	**M.Sc.CARDIAC CARE TECHNOLOGY**
SEMESTER III	
MCCT 112 T	**Echocardiography: Advanced**
CO1	**Apply advanced principles of echocardiography:** To assess complex cardiac pathologies including congenital, valvular, ischemic, and cardiomyopathic conditions.
CO2	**Perform and interpret specialized echocardiographic modalities :** such as Doppler, color flow mapping, tissue Doppler imaging, contrast echocardiography, and stress echocardiography.
CO3	**Correlate echocardiographic findings with clinical and hemodynamic data:** to assist in diagnosis, therapeutic planning, and follow-up in cardiology and cardiac surgery.
CO4	**Demonstrate professional competence in advanced echocardiography practice** by adhering to safety protocols, patient care ethics, and evolving technological advancements in cardiac imaging.
MCCT 113 T	**Quality Assurance, Standardization & Accrediation (Cardiac Care)**
CO1	Understand and explain the principles of quality assurance, standardisation, and accreditation in healthcare, with emphasis on cardiac care services.

CO2	Apply quality control protocols and accreditation standards (NABH, NABL, AERB, BARC, JCI) to ensure accuracy, patient safety, and compliance in clinical practice.
CO3	Demonstrate competency in documentation, audits, and continuous quality improvement processes to maintain standardised and accredited cardiac care facilities.
MCCT 114	**Research Project/ Dissertation**
CO1	Demonstrate the ability to identify, formulate, and justify a clinically relevant research problem in the field of cardiac care technology using evidence-based resources.
CO2	Apply appropriate research methodology, data collection techniques, and statistical tools to analyze and interpret findings in cardiac sciences.
CO3	Communicate research outcomes effectively through scientific writing, presentations, and defend the dissertation with ethical integrity and academic rigor.
MCCT 115 P	**Echocardiography: Advanced**
CO1	Perform and optimize advanced echocardiographic techniques (2D, Doppler, strain imaging, contrast echo) with accuracy in diverse clinical scenarios.
CO2	Analyze and interpret complex echocardiographic findings to aid in the diagnosis and management of structural, valvular, and congenital heart diseases.
CO3	Demonstrate proficiency in patient preparation, equipment handling, image acquisition, and adherence to safety and ethical standards during echocardiographic procedures.
MCCT 116 CP	**MCCT Directed Clinical Education-III**
CO1	Apply advanced theoretical knowledge to real-world clinical scenarios in the cath lab, echocardiography lab, and cardiac critical care settings.
CO2	Demonstrate proficiency in assisting advanced cardiac procedures such as interventional cardiology techniques, electrophysiology studies, and peri-procedural echocardiography.
CO 3	Integrate patient data, imaging, and hemodynamic parameters to support accurate diagnosis, therapeutic decisions, and procedural planning.
CO 4	Exhibit professional and ethical clinical practice by ensuring patient safety, maintaining sterile technique, and adhering to institutional and accreditation protocols.
SEMESTER IV	
MCCT 117 T	**Cardiac Cathterization: Advanced**
CO1	Demonstrate advanced knowledge of hemodynamics, coronary angiography, structural heart evaluations, and apply theoretical concepts to clinical practice in the cath lab.
CO2	Perform and assist in complex diagnostic and interventional cardiac catheterisation procedures, applying appropriate techniques for coronary, structural, and peripheral interventions.
CO3	Analyze hemodynamic data, angiographic findings, and physiological assessments (FFR/iFR) to support accurate diagnosis, clinical decision-making, and patient management in collaboration with the cardiac team.
CO4	Adhere to standards of radiation safety, infection control, and quality assurance while managing complications effectively and demonstrating ethical and professional responsibility in the cath lab.
MCCT 118 T	**Pediatric and Congenital Cardiology**
CO1	Demonstrate comprehensive knowledge of paediatric and congenital cardiovascular anatomy, physiology, and common heart defects.
CO2	Perform and interpret diagnostic cardiac catheterisation, hemodynamic measurements, shunt calculations, and angiography in children.
CO3	Assist in interventional procedures including balloon valvuloplasty, device closure of ASD/VSD/PDA, stenting, and hybrid procedures in paediatric patients
CO4	Identify, manage, and prevent complications in congenital cardiology practice.
MCCT 119 CP	**MCCT Directed Clinical Education-IV**
CO1	Apply theoretical knowledge of cardiac catheterisation, pediatric, and congenital cardiology to real-world clinical settings through supervised training and case-based learning.
CO 2	Demonstrate competency in assisting diagnostic and interventional catheterisation procedures in adults and children, including evaluation of congenital heart diseases and shunt assessments.

CO 3	Interpret hemodynamic data, angiographic findings, and clinical presentations in pediatric and congenital cases to contribute effectively to diagnostic and therapeutic decision-making.
CO4	Exhibit effective teamwork, communication skills, adherence to safety standards, and ethical responsibility while engaging in direct patient care in the cath lab and pediatric cardiology units.
MCCT 114	**Research Project/ Dissertation**
CO1	Design and execute a research study in cardiac sciences by applying appropriate experimental or clinical methodologies.
CO 2	Collect, manage, and analyze research data using suitable biostatistical tools, ensuring validity and reliability of results.
CO 3	Present and defend research findings effectively through dissertation writing, viva-voce, and scientific presentations, while upholding ethical and professional standards.

CO PO Mapping **Annexure-18H of AC-52/2025**

Programe - M.Sc. Cardiac Care Technology

Semester III and IV

PO1 **Knowledge and skill:** Demonstrate in-depth theoretical and practical knowledge of advanced echocardiography and cardiac catheterisation,congenital heart disease evaluation, quality standards, and research methodologies to

PO2 **Critical Thinking &problem solving:** Apply analytical reasoning to interpret echocardiographic, hemodynamic, and quality-related data; identify clinical problems; and develop evidence-based solutions in both adult and pe

PO3 **Decision making:** Integrate diagnostic findings from echocardiography and cath lab with clinical presentations to assist in timely therapeutic, interventional, or surgical decision-making while considering patient safety and ou

PO4 **Research skill:** Design and conduct independent research/dissertations, critically appraise scientific literature, and contribute to innovation, publications, and evidence-based practice in cardiac care technology.

PO5 **Individual and team work:** Collaborate effectively in multidisciplinary teams comprising cardiologists, pediatric cardiologists, surgeons, technologists, and researchers to ensure seamless patient-centered care.

PO6 **Communication skills:** Demonstrate professional communication by accurately documenting, presenting, and discussing findings with healthcare professionals, and by educating and counseling patients and families with emp

PO7 **Code of ethics:** Uphold ethical principles including patient confidentiality, integrity, radiation and procedural safety, adherence to accreditation standards, and compassionate care in both adult and pediatric contexts.

PO8 **Lifelong learning:** Commit to continuous self-learning and professional development by keeping pace with advances in interventional cardiology, echocardiographic imaging, accreditation standards, and research innovations

PO Mapping same with correlation level 3,2,1 The notation of 1 - low, 2 - moderate , 3 - high

Semester	Course / Course Code	Course Outcome	Course Outcome Detail	Knowledge and skill	Critical Thinking &problem solving	Decision making	Research skill	Individual and team work	Communication skills	Code of ethics	Lifelong learning
				PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8
Semester III	Echocardiography: Advanced (MCCT 112 T)	CO1	**Apply advanced principles of echocardiography:** To assess complex cardiac pathologies including congenital, valvular, ischemic, and cardiomyopathic conditions.	3	3	3	2	3	3	3	3
		CO2	**Perform and interpret specialized echocardiographic modalities :** such as Doppler, color flow mapping, tissue Doppler imaging, contrast echocardiography, and stress echocardiography.	3	3	3	1	3	3	3	3
		CO3	**Correlate echocardiographic findings with clinical and hemodynamic data:** to assist in diagnosis, therapeutic planning, and follow-up in cardiology and cardiac surgery.	3	3	3	2	3	3	3	3
		CO4	**Demonstrate professional competence in advanced echocardiography practice** by adhering to safety protocols, patient care ethics, and evolving technological advancements in cardiac imaging.	3	3	3	2	3	3	3	3
	Quality Assurance, Standardization & Accrediation (Cardiac Care) (MCCT 113 T)	CO1	Understand and explain the principles of quality assurance, standardisation, and accreditation in healthcare, with emphasis on cardiac care services.	3	2	2	1	3	3	3	3
		CO2	Apply quality control protocols and accreditation standards (NABH, NABL, AERB, BARC, JCI) to ensure accuracy, patient safety, and compliance in clinical practice.	3	3	3	1	3	3	3	3

		CO3	Demonstrate competency in documentation, audits, and continuous quality improvement processes to maintain standardised and accredited cardiac care facilities.	3	3	3	1	3	3	3	3
	Research Project/ Dissertation (MCCT 114)	**CO1**	Demonstrate the ability to identify, formulate, and justify a clinically relevant research problem in the field of cardiac care technology using evidence-based resources.	3	3	3	3	3	3	3	3
		CO2	Apply appropriate research methodology, data collection techniques, and statistical tools to analyze and interpret findings in cardiac sciences.	3	3	3	3	3	3	3	3
		CO3	Communicate research outcomes effectively through scientific writing, presentations, and defend the dissertation with ethical integrity and academic rigor.	3	3	3	3	3	3	3	3
	Echocardiography: Advanced (MCCT 115 P)	**CO1**	Perform and optimize advanced echocardiographic techniques (2D, Doppler, strain imaging, contrast echo) with accuracy in diverse clinical scenarios.	3	3	2	2	3	3	3	3
		CO2	Analyze and interpret complex echocardiographic findings to aid in the diagnosis and management of structural, valvular, and congenital heart diseases.	3	3	2	2	3	3	3	3
		CO3	Demonstrate proficiency in patient preparation, equipment handling, image acquisition, and adherence to safety and ethical standards during echocardiographic procedures.	3	3	2	3	3	3	3	3
	MCCT Directed Clinical Education-III (MCCT 116 CP)	**CO1**	Apply advanced theoretical knowledge to real-world clinical scenarios in the cath lab, echocardiography lab, and cardiac critical care settings.	3	3	2	1	3	3	3	3
		CO 2	Demonstrate proficiency in assisting advanced cardiac procedures such as interventional cardiology techniques, electrophysiology studies, and peri-procedural echocardiography.	3	3	3	1	3	3	3	3
		CO3	Integrate patient data, imaging, and hemodynamic parameters to support accurate diagnosis, therapeutic decisions, and procedural planning.	3	3	3	1	3	3	3	3
		CO 4	Exhibit professional and ethical clinical practice by ensuring patient safety, maintaining sterile technique, and adhering to institutional and accreditation protocols.	3	3	3	1	3	3	3	3
Semester IV	**Cardiac Cathterization: Advanced (MCCT 117 T)**	**CO1**	Demonstrate advanced knowledge of hemodynamics, coronary angiography, structural heart evaluations, and apply theoretical concepts to clinical practice in the cath lab.	3	3	2	1	3	3	3	3

	CO2	Perform and assist in complex diagnostic and interventional cardiac catheterisation procedures, applying appropriate techniques for coronary, structural, and peripheral interventions.	3	3	2	1	3	3	3	3
	CO3	Analyze hemodynamic data, angiographic findings, and physiological assessments (FFR/iFR) to support accurate diagnosis, clinical decision-making, and patient management in collaboration with the cardiac team.	3	3	2	1	3	3	3	3
	CO4	Adhere to standards of radiation safety, infection control, and quality assurance while managing complications effectively and demonstrating ethical and professional responsibility in the cath lab.	3	3	3	1	3	3	3	3
Pediatric and Congenital Cardiology (MCCT 118 T)	**CO1**	Demonstrate comprehensive knowledge of paediatric and congenital cardiovascular anatomy, physiology, and common heart defects.	3	3	3	1	3	3	3	3
	CO2	Perform and interpret diagnostic cardiac catheterisation, hemodynamic measurements, shunt calculations, and angiography in children.	3	3	2	1	3	3	3	3
	CO3	Assist in interventional procedures including balloon valvuloplasty, device closure of ASD/VSD/PDA, stenting, and hybrid procedures in paediatric patients	3	3	2	1	3	3	3	3
	CO4	Identify, manage, and prevent complications in congenital cardiology practice.	3	3	3	1	3	3	3	3
MCCT Directed Clinical Education-IV (MCCT 119 CP)	**CO1**	Apply theoretical knowledge of cardiac catheterisation, pediatric, and congenital cardiology to real-world clinical settings through supervised training and case-based learning.	3	3	2	2	3	3	3	3
	CO 2	Demonstrate competency in assisting diagnostic and interventional catheterisation procedures in adults and children, including evaluation of congenital heart diseases and shunt assessments.	3	3	3	1	3	3	3	3
	CO 3	Interpret hemodynamic data, angiographic findings, and clinical presentations in pediatric and congenital cases to contribute effectively to diagnostic and therapeutic decision-making.	3	3	2	1	3	3	3	3
	CO 4	Exhibit effective teamwork, communication skills, adherence to safety standards, and ethical responsibility while engaging in direct patient care in the cath lab and pediatric cardiology units.	3	3	3	1	3	3	3	3
Research Project/ Dissertation (MCCT 114)	**CO1**	Design and execute a research study in cardiac sciences by applying appropriate experimental or clinical methodologies.	3	3	3	3	3	3	3	3

		CO 2	Collect, manage, and analyze research data using suitable biostatistical tools, ensuring validity and reliability of results.	3	3	3	3	3	3	3	3
		CO 3	Present and defend research findings effectively through dissertation writing, viva-voce, and scientific presentations, while upholding ethical and professional standards.	3	3	3	3	3	3	3	3