MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Manipal College of Health Professions

Manipal Academy of Higher Education, Manipal

Outcome-Based Education (OBE) Framework

Two Years Full Time
Postgraduate Program
(Choice - Based Credit System)

Master of Science in Cardiac Catheterization and Interventional Technology (MSc. CCIT)

With effect from July 2021

CONTENT PAGE

Head of the Department
Head
Dept. of Cardiovascular Technology
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MAHE, Manipal - 576104

Dean
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Manipal College of Health Professions
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Deputy Registrar - Academics
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Registrar
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MANIPAL COLLEGE OF HEALTH PROFESSIONS MAHE Manipal 576104

1. NATURE AND EXTENT OF THE PROGRAM

Cardiac Catherization and Interventional Technology (CCIT) is a Master program (MSc) which is a specialization under the department of Cardiovascular Technology (CVT) in which students are trained with a wide spectrum of knowledge in cardiovascular diseases and its invasive diagnostic and therapeutic procedures as an interventionist aide. Every candidate is well trained in handling and performing various invasive techniques of imagining modalities to evaluate cardiac diseases independently, also assist in operating equipment and administration of cardiac catheterization procedures in invasive cardiac setup. As in whole "cardiovascular technology" deals with both non-invasive and invasive field of work.

The scope for such allied health workers is boundless in today's medical sectors and near future. The mode of study is firm to be a full time program, with four semester following an 'outcome based educational' system. We aim to keep up our objectives in training the candidates with knowledge of Clinical Cardiology, Electrocardiograms, Cardiac Stress Testing, Ambulatory BP and Holter Monitoring, Cardiovascular Medicine, Electrophysiology studies, Cardiac Pacemakers and Devices, Ethics & Pedagogy, Biostatistics and Research Methodologies, Cardiac Catheterization & Intervention involving all recent advancing techniques used in day to day practices with other customary.

The candidate applying for admission to MSc CCIT program should have passed BSc in Cardiac Care /Cardiovascular Technology (3+1year of internship) on regular basis (Candidates passing B.Sc. in Cardiac Care/ Cardiovascular Technology through correspondence course will not be eligible) examination or equivalent, conducted by the University Board of Education of Government of respective State. At the time of entry/admission to the first year MSc CCIT program the candidate should be of age 21 years or above OR as per rules of the respective universities with regard to the entry age.

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2. PROGRAM EDUCATION OBJECTIVES (PEOs)

The overall objective of the learning outcome-based curriculum framework (LOCF) for MSc Cardiac Catherization and Interventional Technology are as follows:

PEO No.	Education Objective
PEO 1	Students will be able to use their fundamental knowledge and clinical competence in various scientific aspects of Cardiac Catherization and Interventional Technology.
PEO 2	Students will demonstrate strong and well defined clinical / practical skills in performing various skill based activities in catherization laboratory of cardiac interventional suit.
PEO 3	Students will be able to practice the profession with highly professional and ethical attitude, strong communication skills, and to work in an inter-disciplinary team so as to achieve professional excellence.
PEO 4	Students will be able to use interpersonal and collaborative skills to identify, assess and formulate problems and execute the solution to assess the capability of handling cases independently.
PEO 5	Students will be able to imbibe the culture of research, innovation, entrepreneurship and incubation through evidence-based learning to uplift the knowledge in recent techniques and procedures.
PEO 6	Students will be able to participate in lifelong learning process for a highly productive career and will be able to relate the concepts of trends and issues in the discipline of interventional cardiology and other procedural skills.

3. GRADUATE ATTRIBUTES

S No.	Attribute	Description
1	**Domain Knowledge**	Demonstrate comprehensive knowledge, competency and understanding of one or more disciplines that form a part of a professional domain
2	**Clinical / Hands-on skills**	Demonstrate clinical / hands-on skills in order to deliver and manage quality health care services
3	**Communication Skills**	Demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups using appropriate media.
4	**Team work**	Demonstrate the ability to effectively and efficiently work and collaborate with diverse teams in the best interest of health care needs of the community
5.	**Professional ethics**	Demonstrate the ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in professional life.
6.	**Research / Innovation-related Skills**	A sense of inquiry and investigation for raising relevant and contemporary questions, synthesizing and articulating.
7.	**Critical thinking and problem solving**	Demonstrate capacity to think critically and extrapolate from what one has learned by applying their competencies and knowledge to solve different kinds of non-familiar problems in real life situations.
8	**Information/Digital Literacy**	Demonstrate capability to use ICT in a variety of learning situations, demonstrate ability to

S No.	Attribute	Description
		access, evaluate, and use a variety of relevant information sources and to use appropriate software for analysis of data.
9	Multicultural Competence	Demonstrate knowledge of the values and beliefs of multiple cultures and a global perspective, effectively engage in a multicultural society, interact respectfully with diverse groups.
11.	Leadership qualities	Demonstrate leadership capability to formulate an inspiring vision, build a team, motivate and inspire team members to attain organizational vision
12.	Lifelong Learning	Demonstrate the ability to acquire knowledge and skills, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to demands of work place through knowledge/skill development/reskilling.

4. QUALIFICATION DESCRIPTORS:

a) Demonstrate (i) a systematic, extensive and coherent knowledge and understanding of an academic field of study as a whole and its applications, and links to related disciplinary areas/subjects of study, including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues/theories in the field of Cardiac Catherization and interventional technology ; (ii) procedural knowledge that creates different types of professionals related to the disciplinary/subject area of study, including research and development, teaching and government and public service; (iii) skills in areas related to one's specialization and current developments in the academic field of Cardiac Catherization and interventional technology, including a critical understanding of the latest developments in the area of specialization, and an ability to use established techniques of analysis and enquiry within the area of specialization Cardiac Catherization and interventional technology.

b) Demonstrate comprehensive knowledge about materials and methods, including professional literature relating to essential and advanced learning areas pertaining to the chosen disciplinary area(s) and field of study, and techniques and skills required for identifying/solving problems and issues relating to the disciplinary area and field of study.

c) Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, analysis and interpretation of data using methodologies as appropriate to the subject(s) for formulating evidence-based solutions and arguments.

d) Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the field

e) Communicate appropriately with all stakeholders, and provide relevant information to the members of the healthcare team

f) Address one's own learning needs relating to current and emerging areas of study, making use of research, development and professional materials as appropriate, including those related to new frontiers of knowledge

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(A constituent unit of MAHE, Manipal)

The subject code equivalence for subjects mentioned in syllabus copy of course **M.Sc. Cardiac Catheterization and Interventional Technology** from the academic year **2021-22** onwards. These changes have been discussed in BOS meeting held on 13.12.2021 and subsequently approved in the 70th Academic Council meeting held on 14.01.2022.

SEMESTER – I

Course Title	Old Course Code	Revised Course Code
Advanced Biostatistics and Research Methodology	ABS6101	ABS5101
Basics in Cardiac Catheterization and Intervention	CCI6101	CCI5101
Radiation Evaluation and Protection	CCI6102	CCI5102
Practicals - I	CCI6111	CCI5111
Clinics - I	CCI6131	CCI5131
Project - I	CCI6151	CCI5151

SEMESTER - II

Course Title	Old Course Code	Revised Course Code
Ethics & Pedagogy	EPG6201	EPG5201
Cardiovascular medicine	CVT6201	CVT5201
Cardiac Cath And Intervention in IHD and VHD	CCI6201	CCI5201
Practicals - II	CCI6211	CCI5211
Clinics -II	CCI6231	CCI5231
Project- II	CCI6251	CCI5251

SEMESTER - III

Course Title	Old Course Code	Revised Course Code
Heart Failure	CVT7101	CVT6101
Cardiac Cath and Intervention In CHD	CCI7101	CCI6101
Electrophysiology and Cardiac Pacemakers	CCI7102	CCI6102
Practicals - III	CCI7111	CCI6111
Clinics -III	CCI7131	CCI6131
Project- III	CCI7151	CCI6151
Program Elective:		
Heart Failure Devices	CVT 7011	CVT6011
ICD Devices	CVT 7021	CVT6021
3D mapping and Ablation	CCI 7011	CCI6011

SEMESTER - IV

Course Title	Old Course Code	Revised Course Code
Cardiovascular Surgery	CVT7201	CVT6201
Cardiac Cath and Intervention in Miscellaneous Diseases	CCI7201	CCI6201
Recent Advances in Cardiac Cath and Intervention	CCI7202	CCI6202
Practicals - IV	CCI7211	CCI6211
Clinics - IV	CCI7231	CCI6231
Project - IV	CCI7251	CCI6251

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g) Apply one's domain knowledge and transferable skills that are relevant to some of the job trades, employment opportunities and seek solutions to real-life problems.

5. PROGRAM OUTCOMES (POs):

After successful completion of Masters / MSc Cardiac Catherization and interventional technology program students will be able to:

PO No.	Attribute	Competency
PO 1	Domain knowledge	Possess and acquire **scientific knowledge** to work as a health care professional
PO 2	Clinical/ Hands-on skills	Demonstrate and possess **clinical and hands-on skills** to provide quality health care services
PO 3	Team work	Demonstrate **team work skills** to support shared goals with the interdisciplinary health care team to improve societal health
PO 4	Ethical value & professionalism	Possess and demonstrate **ethical values and professionalism** within the legal framework of the society
PO 5	Communication	**Communicate effectively** and appropriately with the interdisciplinary health care team and the society
PO 6	Evidence based practice	Demonstrate high quality **evidence based practice** that leads to excellence in professional practice
PO 7	Life-long learning	Enhance knowledge and skills with the use of advancing technology for the **continual improvement** of professional practice
PO 8	Entrepreneurship, leadership and mentorship	Display **entrepreneurship, leadership and mentorship** skills to practice independently as well as in collaboration with the interdisciplinary health care team

PROGRAM ELECTIVE

Program elective is credited and choice based. The student makes a choice from the pool of electives offered by the department. The ESE is conducted for 50 marks.

Semester	Couse Code	Course Title	Credit(s) Distribution (L,T,P,CL are hours/week)				
			L	T	P	CL	CR
III	CVT 7011	Heart Failure Devices	3	-	-	-	3
	CVT 7021	ICD Devices	3	-	-	-	3
	CCI 7011	3D mapping and Ablation	3	-	-	-	3

OVERALL CREDIT DISTRIBUTION

SEMESTER	Credit distribution				Total Credits	Marks Distribution		
	L	T	P	CL/PW		IAC	ESE	Total
I - SEMESTER	9	5	4	12	20	430	270	700
II - SEMESTER	7	5	4	18	20	450	150	600
III - SEMESTER	6	4	4	15	20	450	250	700
IV - SEMESTER	6	4	8	18	20	300	300	600
Grand Total	28	18	20	63	80	1630	970	2600

INTERNAL ASSESSMENT COMPONENT (IAC) WEIGHTAGE DISTRIBUTION

Theory		Practical	
Components	%	Components	%
Mid semester exam	60	Mid semester exam	60
Class seminar	20	Record submission	20
Assignments/Quiz	20	Competency in bench mark	20