Annexure-3.22 of AC-51/2025

PROGRAM OUTCOME (POs)	
Course Code	**M.Sc. MEDICAL RADIOLOGY AND IMAGING TECHNOLOGY**
PO1	**Advanced Knowledge of Radiology and Imaging Techniques:** Graduates will possess in-depth knowledge of the principles, technologies, and clinical applications of various medical imaging modalities (X-ray, CT, MRI, ultrasound, nuclear medicine, etc.) and their role in diagnosis and treatment.
PO2	**Technical Proficiency in Imaging Equipment:** Graduates will demonstrate the ability to operate, troubleshoot, and maintain advanced radiology and imaging equipment, ensuring safe, accurate, and effective image acquisition.
PO3	**Radiation Safety and Protection:** Graduates will understand the principles of radiation protection and safety, and will be skilled in minimizing patient exposure to radiation while ensuring high-quality diagnostic images
PO4	**Image Analysis and Interpretation:** Graduates will be proficient in the interpretation of diagnostic images, identifying normal and abnormal findings, and understanding their significance in clinical practice for accurate diagnosis and treatment planning.
PO5	**Research and Evidence-Based Practice:** Graduates will be able to critically evaluate and apply current research in medical imaging to enhance practice, contribute to the field's advancement, and engage in evidence-based decision-making in clinical settings.
PO6	**Ethical and Professional Practice:** Graduates will demonstrate high standards of professional and ethical behavior in patient care, maintaining patient confidentiality, consent, and dignity, while working collaboratively in multidisciplinary healthcare teams.
PO 7	**Leadership and Management in Imaging Technology:** Graduates will be capable of leading and managing imaging departments or teams, contributing to healthcare administration, quality control, and continuous improvement in imaging practices.
PO8	**Continuing Education and Professional Development:** Graduates will engage in lifelong learning, staying current with emerging technologies, regulatory standards, and advancements in radiology and imaging technology, contributing to the continuous improvement of healthcare services.
COURSE OUTCOMES (COs)	
Course Code	**M.Sc. MEDICAL RADIOLOGY AND IMAGING TECHNOLOGY**
SEMESTER I	
MMRIT 101 T MMRIT 103 P	**Principles of Radiographic Exposure**
CO1	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality
CO2	Categorizing provisions for radiation safety by various national & international regulatory bodies.
CO3	Tagging of different imaging modalities in radiology department
CO4	Differentiating EMR and its application in X –ray diagnosis and therapy.
CO5	Evaluating the factors affecting the image quality from x ray.
MMRIT 102 T	**Radiation Protection in Diagnostic Radiology**
CO1	Understanding the concepts and methods of radiation protection principles and their applications in radiology department.
CO2	Obtaining knowledge for management and handling the equipment for various procedures.
CO3	Applying the regulations of radiation practices according to internationally accepted methods.
CO4	Practicing the techniques of radiation protection of patients, occupational workers and general public from secondary radiation.
CC 001 T CC 001 P	**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.
MMRIT 104 CP	**MMRIT Directed Clinical Education-I**
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.
CO2	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.
CO3	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	
MMRIT 105 T	**Radiological Procedures**
CO1	Annotating the basic concepts, theories, techniques & equipment, in and conventional radiography relevant to X-Ray equipment.
CO2	Tagging related anatomy of organ for independently performing different diagnostic radiologic procedures.
CO3	Discussing equipment and supplies necessary to complete special radiographic procedures with administration of contrast media.
CO4	Evaluating the safety aspects of contrast media and describe the allergic reactions associated to use of different contrast media for diagnostic purpose.
MMRIT 106 T	**Instrumentation of Conventional Radiological Equipments**
CO1	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality.

CO2	Expressing the components and working of equipments related to x-ray
CO3	Operating X-Ray imaging equipment independently
CO4	Demonstrating application of different components of x-ray.
CO5	Analyzing maintenance requirement and care of x ray equipment in radiology department.
MMRIT 107 T	**Insturmentation of Specialized Radiology Equipements**
CO1	Understanding the basic concepts, theories, techniques & equipments for different interventional radiological procedures.
CO2	Applying the patient preparations needed before & post procedure care in any interventional radiological examination.
CO3	Applying provisions for radiation safety and protection as prescribed by various national & international regulatory bodies.
CO4	Calculating the factors affecting the image quality
CO5	Applying Care, maintenance and tests, Quality assurance program for equipments.
MMRIT 109 CP	**MMRIT 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.
CO2	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.
CO3	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 COURSE	
SEC 001 T	**Innvotion 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's 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.

MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)
(Deemed University u/s 3 of UGC Act 1956)
Grade "A++" Accredited by NAAC
Sector 1, Kamothe Navi Mumbai-410209, Tel.No.:022-27437631,27432890
Email. sbsnm@mgmuhs.com / Website : www.mgmsbsnm.edu.in

CO PO Mapping
Programe - M.Sc. Medical Radiology and Imaging Technology
Semester I and II

PO1	**Advanced Knowledge of Radiology and Imaging Techniques:** Graduates will possess in-depth knowledge of the principles, technologies, and clinical applications of various medical imaging modalities (X-ray, CT, MRI, ultrasound, nuclear medicine, etc.) and their role in diagnosis and treatment.
PO2	**Technical Proficiency in Imaging Equipment:** Graduates will demonstrate the ability to operate, troubleshoot, and maintain advanced radiology and imaging equipment, ensuring safe, accurate, and effective image acquisition.
PO3	**Radiation Safety and Protection:** Graduates will understand the principles of radiation protection and safety, and will be skilled in minimizing patient exposure to radiation while ensuring high-quality diagnostic images.
PO4	**Image Analysis and Interpretation:** Graduates will be proficient in the interpretation of diagnostic images, identifying normal and abnormal findings, and understanding their significance in clinical practice for accurate diagnosis and treatment planning.
PO5	**Research and Evidence-Based Practice:** Graduates will be able to critically evaluate and apply current research in medical imaging to enhance practice, contribute to the field's advancement, and engage in evidence-based decision-making in clinical settings.
PO6	**Ethical and Professional Practice:** Graduates will demonstrate high standards of professional and ethical behavior in patient care, maintaining patient confidentiality, consent, and dignity, while working collaboratively in multidisciplinary healthcare teams.
PO7	**Leadership and Management in Imaging Technology:** Graduates will be capable of leading and managing imaging departments or teams, contributing to healthcare administration, quality control, and continuous improvement in imaging practices.
PO8	**Continuing Education and Professional Development:** Graduates will engage in lifelong learning, staying current with emerging technologies, regulatory standards, and advancements in radiology and imaging technology, contributing to the continuous improvement of healthcare services.

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	Advanced Knowledge of Radiology and Imaging Techniques	Technical Proficiency in Imaging Equipment	Radiation Safety and Protection	Image Analysis and Interpretation	Research and Evidence-Based Practice	Ethical and Professional Practice	Leadership and Management in Imaging Technology	Continuing Education and Professional Development	Average
				PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	
Semester 1	**Principle of Radiographic Expousre MMRIT 101 T**	CO1	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality	3	3	1	2	0	2	0	3	1.8
		CO2	Categorizing provisions for radiation safety by various national & international regulatory bodies.	2	2	3	1	3	3	2	3	2.4
		CO3	Tagging of different imaging modalities in radiology department	3	3	1	3	3	2	2	3	2.5
		CO4	Differentiating EMR and its application in X–ray diagnosis and therapy.	3	3	1	3	3	1	1	3	2.3
		CO5	Evaluating the factors affecting the image quality from x+D48 ray.	3	3	0	0	3	1	1	3	1.8
		Average		2.8	2.8	1.2	1.8	2.4	1.8	1.2	3.0	2.1
	Radiation Protection in Diagnostic Radiology MMRIT 102 T	CO1	Understanding the concepts and methods of radiation protection principles and their applications in radiology department.	0	2	3	1	3	3	3	3	2.3
		CO2	Obtaining knowledge for management and handling the equipment for various procedures.	0	3	3	2	3	3	3	3	2.5
		CO3	Applying the regulations of radiation practices according to internationally accepted methods.	0	3	3	1	3	3	3	3	2.4
		CO4	Practicing the techniques of radiation protection of patients, occupational workers and general public from secondary radiation.	2	1	3	3	3	3	3	3	2.6

		Average		0.5	2.25	3	1.75	3	3	3	3	2.4
	Research Methodology & Biostatistics CC 001 T	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.	0	0	0	0	3	1	1	2	0.9
		Average		0	0.0	0.0	0	3	1	1	2.0	0.9
	Principle of Radiographic Expousre MMRIT 103 P	CO1	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality	3	3	1	2	0	2	0	3	1.8
		CO2	Categorizing provisions for radiation safety by various national & international regulatory bodies.	2	2	3	1	3	3	2	3	2.4
		CO3	Tagging of different imaging modalities in radiology department	3	3	1	3	3	2	2	3	2.5
		CO4	Differentiating EMR and its application in X-ray diagnosis and therapy.	3	3	1	3	3	1	1	3	2.3
		CO5	Evaluating the factors affecting the image quality from x-ray.	3	3	0	0	3	1	1	3	1.8
		Average		2.8	2.8	1.2	1.8	2.4	1.8	1.2	3.0	2.1
	MMRIT Directed Clinical Education-I MMRIT 104 CP	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.	3	3	2	2	1	3	3	3	2.5
		CO2	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.	1	3	3	3	3	3	3	3	2.8
		CO3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.	1	3	2	2	1	3	3	3	2.3
		Average		1.7	3.0	2.3	2.3	1.7	3.0	3.0	3.0	2.5
	Research Methodology & Biostatistics CC001 P	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.	3	0	0	0	3	1	1	2	1.3
		Average		3	0	0	0	3	1	1	2	1.3
Semester 2	**Radiological Procedures MMRIT 105 T**	CO1	Annotating the basic concepts, theories, techniques & equipment, in and conventional radiography relevant to X-Ray equipment.	3	3	0	2	2	3	3	2	2.3
		CO2	Tagging related anatomy of organ for independently performing different diagnostic radiologic procedures.	0	3	2	3	1	3	1	3	2.0
		CO3	Discussing equipment and supplies necessary to complete special radiographic procedures with administration of contrast media.	3	3	2	3	1	3	1	3	2.4
		CO4	Evaluating the safety aspects of contrast media and describe the allergic reactions associated to use of different contrast media for diagnostic purpose.	0	1	2	1	1	3	1	2	1.4
		Average		1.5	2.5	1.5	2.3	1.3	3.0	1.5	2.5	2.0
	Instrumentation of Conventional Radiological Equipment MMRIT 106 T	CO1	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality.	3	3	1	3	1	1	2	3	2.1
		CO2	Expressing the components and working of equipments related to x-ray	3	3	1	2	1	3	1	2	2.0
		CO3	Operating X-Ray imaging equipment independently	3	3	2	1	2	3	3	3	2.5
		CO4	Demonstrating application of different components of x-ray.	3	3	1	2	1	3	3	2	2.3
		CO5	Analyzing maintenance requirement and care of x ray equipment in radiology department.	3	3	1	1	1	3	3	3	2.3
		Average		3.0	3.0	1.2	1.8	1.2	2.6	2.4	2.6	2.2

Instrumentation of Specialized Radiology Equipment MMRIT 107 T	CO1	Understanding the basic concepts, theories, techniques & equipments for different interventional radiological procedures.	3	3	1	3	2	3	3	2	2.5
	CO2	Applying the patient preparations needed before & post procedure care in any interventional radiological examination.	0	3	1	3	1	3	3	1	1.9
	CO3	Applying provisions for radiation safety and protection as prescribed by various national & international regulatory bodies.	0	1	3	1	3	3	2	2	1.9
	CO4	Calculating the factors affecting the image quality	0	3	1	3	2	3	3	2	2.1
	CO5	Applying Care, maintenance and tests, Quality assurance program for equipments.	1	1	1	1	3	3	3	3	2.0
	Average		0.8	2.2	1.4	2.2	2.2	3	2.8	2	2.1
Radioological Procedures MMRIT 108 P	CO1	Annotating the basic concepts, theories, techniques & equipment, in and conventional radiography relevant to X-Ray equipment.	3	3	0	2	2	3	3	2	2.3
	CO2	Tagging related anatomy of organ for independently performing different diagnostic radiologic procedures.	0	3	2	3	1	3	1	3	2.0
	CO3	Discussing equipment and supplies necessary to complete special radiographic procedures with administration of contrast media.	3	3	2	3	1	3	1	3	2.4
	CO4	Evaluating the safety aspects of contrast media and describe the allergic reactions associated to use of different contrast media for diagnostic purpose.	0	1	2	1	1	3	1	2	1.4
	Average		1.5	2.5	1.5	2.3	1.3	3.0	1.5	2.5	2.0
MMRIT Directed Clinical Education-II MMRIT 109 CP	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.	3	3	2	2	1	3	3	3	2.5
	CO2	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.	1	3	3	3	3	3	3	3	2.8
	CO3	Focus on developing professionalism, empathy, ethical conduct, teamwork, and communication skills—key traits for holistic patient care and effective collaboration in interdisciplinary healthcare teams.	1	3	2	2	1	3	3	3	2.3
	Average		1.7	3.0	2.3	2.3	1.7	3.0	3.0	3.0	2.5
Innovation and Enterprenureship SEC 001 T	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	0	0	0	3	2	2	3	1.5
	CO2	Cultivating an entrepreneurial mindset and leadership qualities necessary for driving innovation and leading ventures.	1	0	0	0	3	2	3	1	1.3
	CO3	Understanding the intersection of technology and innovation and leveraging emerging technologies for entrepreneurial ventures.	1	0	0	0	3	3	3	3	1.6
	Average		1.3	0.0	0.0	0	3	2.3	2.7	2.3	1.5
ONE Health (NPTEL) SEC 002 T	CO1	A comprehensive understanding of One Health's role in global health challenges, emphasizing interconnectedness among human, animal, and environmental health.	0	0	0	0	2	3	3	3	1.4
	CO2	Topics include research ethics, disease surveillance, and successes in controlling emerging infectious diseases.	0	0	0	0	3	3	3	3	1.5
	CO3	Students explore disease emergence, transmission, antimicrobial resistance, and food safety, gaining insights into effective public health strategies.	0	0	0	0	3	3	3	3	1.5
	Average		0.0	0.0	0.0	0.0	2.7	3.0	3.0	3.0	1.5

Director
MGM School of Biomedical Science
Kamothe, Navi Mumbai

PROGRAM OUTCOME (POs)	
Course Code	**Medical Radiology and Imaging Technology**
PO1	**Advanced Knowledge of Radiology and Imaging Techniques**: Graduates will possess in-depth knowledge of the principles, technologies, and clinical applications of various medical imaging modalities (X-ray, CT, MRI, ultrasound, nuclear medicine, etc.) and their role in diagnosis and treatment.
PO2	**Technical Proficiency in Imaging Equipment**: Graduates will demonstrate the ability to operate, troubleshoot, and maintain advanced radiology and imaging equipment, ensuring safe, accurate, and effective image acquisition.
PO3	**Radiation Safety and Protection:** Graduates will understand the principles of radiation protection and safety, and will be skilled in minimizing patient exposure to radiation while ensuring high-quality diagnostic images
PO4	**Image Analysis and Interpretation:** Graduates will be proficient in the interpretation of diagnostic images, identifying normal and abnormal findings, and understanding their significance in clinical practice for accurate diagnosis and treatment planning.
PO5	**Research and Evidence-Based Practice:** Graduates will be able to critically evaluate and apply current research in medical imaging to enhance practice, contribute to the field's advancement, and engage in evidence-based decision-making in clinical settings.
PO6	**Ethical and Professional Practice:** Graduates will demonstrate high standards of professional and ethical behavior in patient care, maintaining patient confidentiality, consent, and dignity, while working collaboratively in multidisciplinary healthcare teams.
PO 7	**Leadership and Management in Imaging Technology:** Graduates will be capable of leading and managing imaging departments or teams, contributing to healthcare administration, quality control, and continuous improvement in imaging practices.
PO8	**Continuing Education and Professional Development:** Graduates will engage in lifelong learning, staying current with emerging technologies, regulatory standards, and advancements in radiology and imaging technology, contributing to the continuous improvement of healthcare services.
Course Outcomes (COs)	
Course Code	**Medical Radiology and Imaging Technology**
SEMESTER III	
MMRIT 110 T	**Advanved Techniques and Instrumentation of Computed Tomography**
CO1	**Explain the fundamental principles of Computed Tomography (CT)** including basic imaging concepts, Hounsfield Units, CT image formation, and standard terminology
CO2	**Identify and describe the components of a CT scanner** and understand the working principles of its instrumentation including gantry, detectors, data acquisition systems, and slip-ring technology.
CO3	Interpret CT images using appropriate display parameters, including window width/level adjustments, multiplanar reconstructions (MPR), and volume rendering techniques.
CO4	**Explain the techniques and clinical applications of specialized CT procedures**, including CT angiography, CT fluoroscopy, CT perfusion, Denta Scan, CT colonoscopy, CT bronchoscopy, and CT calcium scoring.
CO5	**Discuss recent advancements in CT technology**, including dual-energy CT, photon-counting detectors, AI-assisted post-processing, and high-speed imaging systems.
CO 6	**Develop and follow a comprehensive Quality Assurance (QA) program** for CT, utilizing phantom studies and documentation protocols to maintain image and equipment standards.
MMRIT 111 T	**Advanced Technique and Instrumentation of MRI**
CO1	**Understand and explain the basic physical principles of MRI**, including MR-active nuclei, spin, precession, magnetization, resonance, and relaxation mechanisms.
CO2	**Recognize common MRI artifacts**, understand their causes, and describe methods for their minimization or correction.
CO3	Identify and explain the components of MRI instrumentation
CO4	Describe and differentiate between basic and advanced pulse sequences
CO5	Explain the principles and applications of specialized MRI techniques
CO 6	**Conduct functional and performance tests** as part of a regular MRI Quality Assurance (QA) program to ensure diagnostic image quality and equipment reliability.
MMRIT 112 T	**Advanced Techniques and Instrumentation of Breast Imaging**
CO1	**Explain the historical development and basic principles** of mammography, including conventional and advanced imaging techniques such as xero mammography, screen-film mammography, and digital mammography.
CO2	**Describe the physics of image formation** in mammography and apply this knowledge to optimize image quality while minimizing patient dose.
CO3	**Identify and evaluate mammography instrumentation**, including mammographic cassettes, X-ray tubes, filters, Automatic Exposure Control (AEC) systems, consoles, and C-arm tube stands.
CO4	Explain the principles of digital mammography
CO 5	**Apply sterile techniques** in mammography and breast interventional procedures
CO 6	**Understand the principles and applications of sono mammography**, including ultrasound physics, instrumentation, factors influencing breast density, and image quality optimization.
CO 7	**Integrate technical knowledge with clinical application** to ensure accurate breast imaging, safe patient handling, and high-quality diagnostic outcomes in various clinical scenarios.
MMRIT 113	**Research Project / Disserration**
CO 1	**Identify and formulate a relevant research problem** in the field of medical radiology and imaging technology through a thorough review of literature and clinical observations.
CO 2	**Apply theoretical and clinical knowledge** to develop innovative solutions or improvements in imaging procedures, patient safety, image quality, or radiologic technology.
CO 3	**Write and present a comprehensive research dissertation** in a structured academic format, including introduction, review of literature, methodology, results, discussion, conclusion, and references.
CO 4	**Demonstrate critical thinking and problem-solving skills** by defending the research findings during viva voce or presentation sessions.
CO 5	**Contribute to the scientific community** by producing research work that may lead to publication, presentation at conferences, or implementation in clinical practice.
MMRIT 114 CP	**MMRIT Directed Clinical Education-III**
CO 1	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.

Teaching Learning Methods

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 IV	
MMRIT 115 T	**Quality Assurance and Quality Control in Radiology**
CO1	**Explain the principles and objectives** of Quality Assurance (QA) and Quality Control (QC) in medical imaging, emphasizing the need for high-quality diagnostic images with minimal radiation exposure.
CO2	**Perform and interpret QA program tests** such as light beam alignment, X-ray output and beam quality check, kVp accuracy, focal spot measurement, timer accuracy, mAs linearity, grid alignment, and resolution tests.
CO3	**Demonstrate practical skills** in QA testing for different imaging modalities, including X-ray generators and tubes, image receptors, fluoroscopy, mammography, and computed tomography systems.
CO4	**Apply safe operation procedures** for radiology equipment, including preventive care, cleaning, and maintenance of cassettes, screens, processors, and digital image receptors.
CO5	**Implement radiation safety measures** during QA activities to protect patients, staff, and the public from unnecessary exposure.
CO 6	**Ensure compliance with regulatory and professional standards** for quality control in diagnostic imaging facilities.
MMRIT 116 CP	**MMRIT Directed Clinical Education-IV**
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.
MMRIT 113	**Research Project / Disserration**
CO 1	Identify and formulate a relevant research problem in the field of medical radiology and imaging technology through a thorough review of literature and clinical observations.
CO 2	Apply theoretical and clinical knowledge to develop innovative solutions or improvements in imaging procedures, patient safety, image quality, or radiologic technology.
CO 3	Write and present a comprehensive research dissertation in a structured academic format, including introduction, review of literature, methodology, results, discussion, conclusion, and references.
CO 4	Demonstrate critical thinking and problem-solving skills by defending the research findings during viva voce or presentation sessions.
CO 5	Contribute to the scientific community by producing research work that may lead to publication, presentation at conferences, or implementation in clinical practice.

Annexure-18G of AC-52/2025

MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI
(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)
(Deemed University u/s 3 of UGC Act 1956)
Grade "A++" Accredited by NAAC
Sector 1, Kamothe Navi Mumbai-410209, Tel.No.:022-27437631,27432890
Email. sbsnm@mgmuhs.com / Website : www.mgmsbsnm.edu.in

CO PO Mapping
Programe - M.Sc. Medical Radiology and Imaging Technology
Semester III and IV

PO1 **Advanced Knowledge of Radiology and Imaging Techniques:** Graduates will possess in-depth knowledge of the principles, technologies, and clinical applications of various medical imaging modalities (X-ray, CT, MRI, ultrasound, nuclear medicine, etc.) and their role in diagnosis and treatment.
PO2 **Technical Proficiency in Imaging Equipment:** Graduates will demonstrate the ability to operate, troubleshoot, and maintain advanced radiology and imaging equipment, ensuring safe, accurate, and effective image acquisition.
PO3 **Radiation Safety and Protection:** Graduates will understand the principles of radiation protection and safety, and will be skilled in minimizing patient exposure to radiation while ensuring high-quality diagnostic images.
PO4 **Image Analysis and Interpretation:** Graduates will be proficient in the interpretation of diagnostic images, identifying normal and abnormal findings, and understanding their significance in clinical practice for accurate diagnosis and treatment planning.
PO5 **Research and Evidence-Based Practice:** Graduates will be able to critically evaluate and apply current research in medical imaging to enhance practice, contribute to the field's advancement, and engage in evidence-based decision-making in clinical settings.
PO6 **Ethical and Professional Practice:** Graduates will demonstrate high standards of professional and ethical behavior in patient care, maintaining patient confidentiality, consent, and dignity, while working collaboratively in multidisciplinary healthcare teams.
PO7 **Leadership and Management in Imaging Technology:** Graduates will be capable of leading and managing imaging departments or teams, contributing to healthcare administration, quality control, and continuous improvement in imaging practices.
PO8 **Continuing Education and Professional Development:** Graduates will engage in lifelong learning, staying current with emerging technologies, regulatory standards, and advancements in radiology and imaging technology, contributing to the continuous improvement of healthcare services.

Course / Course Code	Course Outcome	Course Outcome	Advanced Knowledge of Radiology and Imaging Techniques	Technical Proficiency in Imaging Equipment	Radiation Safety and Protection	Image Analysis and Interpretation	Research and Evidence-Based Practice	Ethical and Professional Practice	Leadership and Management in Imaging Technology	Continuing Education and Professional Development	Average
			PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	
Advanced Techniques and Instrumentation of Computed Tomography (MMRIT 110 T)	CO 1	Explain the fundamental principles of Computed Tomography (CT) including basic imaging concepts, Hounsfield Units, CT image formation, and standard terminology	3	3	1	3	2	2	1	3	2.3
	CO 2	Identify and describe the components of a CT scanner and understand the working principles of its instrumentation including gantry, detectors, data acquisition systems, and slip-ring technology.	3	3	3	3	3	2	1	3	2.6
	CO 3	Interpret CT images using appropriate display parameters, including window width/level adjustments, multiplanar reconstructions (MPR), and volume rendering techniques.	3	3	1	3	2	1	3	3	2.4
	CO 4	Explain the techniques and clinical applications of specialized CT procedures, including CT angiography, CT fluoroscopy, CT perfusion, DentaScan, CT colonoscopy, CT bronchoscopy, and CT calcium scoring.	3	3	2	2	3	3	3	3	2.8
	CO 5	Discuss recent advancements in CT technology, including dual-energy CT, photon-counting detectors, AI-assisted post-processing, and high-speed imaging systems.	3	3	2	2	3	1	1	3	2.3
	CO 6	Develop and follow a comprehensive Quality Assurance (QA) program for CT, utilizing phantom studies and documentation protocols to maintain image and equipment standards.	3	1	3	0	3	0	3	3	2.0
	AVERAGE		3.0	2.7	2.0	2.2	2.7	1.5	2.0	3.0	2.4
Advanced Techniques and Instrumentation of MRI (MMRIT 111 T)	CO 1	**Understand and explain the basic physical principles of MRI**, including MR-active nuclei, spin, precession, magnetization, resonance, and relaxation mechanisms.	3	3	0	3	1	3	3	3	2.4
	CO 2	**Recognize common MRI artifacts**, understand their causes, and describe methods for their minimization or correction.	3	3	0	3	3	3	3	3	2.6
	CO 3	Identify and explain the components of MRI instrumentation	3	3	0	0	1	0	1	3	1.4
	CO 4	Describe and differentiate between basic and advanced pulse sequences	3	3	0	3	1	3	3	3	2.4
	CO 5	Explain the principles and applications of specialized MRI techniques	3	3	0	3	1	1	3	3	2.1
	CO 6	**Conduct functional and performance tests** as part of a regular MRI Quality Assurance (QA) program to ensure diagnostic image quality and equipment reliability.	3	3	0	0	3	3	3	3	2.3
	AVERAGE		3	3	0	2	1.6	2.1	2.6	3	2.2
	CO 1	**Explain the historical development and basic principles** of mammography, including conventional and advanced imaging techniques such as xero mammography, screen-film mammography, and digital mammography.	3	3	0	3	3	3	0	3	2.3
	CO 2	**Describe the physics of image formation** in mammography and apply this knowledge to optimize image quality while minimizing patient dose.	3	3	3	3	2	3	0	3	2.5

SEM 3	**Advanced Techniques and Instrumentation of Breast Imaging (MMRIT 112 T)**	CO 3	Identify and evaluate mammography instrumentation, including mammographic cassettes, X-ray tubes, filters, Automatic Exposure Control (AEC) systems, consoles, and C-arm tube stands.	3	3	3	3	1	3	0	3	2.4
		CO 4	Explain the principles of digital mammography	3	3	3	0	0	0	3	3	1.9
		CO 5	**Apply sterile techniques** in mammography and breast interventional procedures	3	3	0	0	1	3	3	3	2.0
		CO 6	**Understand the principles and applications of sono mammography**, including ultrasound physics, instrumentation, factors influencing breast density, and image quality optimization.	3	3	3	0	3	3	3	3	2.6
		CO 7	**Integrate technical knowledge with clinical application** to ensure accurate breast imaging, safe patient handling, and high-quality diagnostic outcomes in various clinical scenarios.	3	3	3	3	3	3	3	3	3.0
		AVERAGE		3	3.0	2.1	1.7	1.4	2.4	1.2	3.0	2.2
	RESEARCH PROJECT / DISSERTATION (MMRIT 113 T)	CO 1	**Identify and formulate a relevant research problem** in the field of medical radiology and imaging technology through a thorough review of literature and clinical observations.	3	2	0	0	3	3	3	3	2.1
		CO 2	**Apply theoretical and clinical knowledge** to develop innovative solutions or improvements in imaging procedures, patient safety, image quality, or radiologic technology.	3	0	0	0	3	3	3	3	1.9
		CO 3	**Write and present a comprehensive research dissertation** in a structured academic format, including introduction, review of literature, methodology, results, discussion, conclusion, and references.	0	0	0	0	3	3	3	3	1.5
		CO 4	**Demonstrate critical thinking and problem-solving skills** by defending the research findings during viva voce or presentation sessions.	0	0	0	0	3	3	3	3	1.5
		CO 5	**Contribute to the scientific community** by producing research work that may lead to publication, presentation at conferences, or implementation in clinical practice.	0	0	0	0	3	3	3	3	1.5
		AVERAGE		1.2	0.4	0.0	0.0	3.0	3.0	3.0	3.0	1.7
	MMRIT Directed Clinical Education – III (MMRIT 114 CP)	CO 1	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.	3	3	2	2	1	3	3	3	2.5
		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.	1	3	3	3	3	3	3	3	2.8
		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.	1	3	2	2	1	3	3	3	2.3
		AVERAGE		1.7	3.0	2.3	2.3	1.7	3.0	3.0	3.0	2.5
SEM 4	**Quality Assurance and Quality Control in Radiology (MMRIT 115 T)**	CO 1	Explain the principles and objectives of Quality Assurance (QA) and Quality Control (QC) in medical imaging, emphasizing the need for high-quality diagnostic images with minimal radiation exposure.	3	3	3	0	0	3	0	3	1.9
		CO 2	Perform and interpret QA program tests such as light beam alignment, X-ray output and beam quality check, kVp accuracy, focal spot measurement, timer accuracy, mAs linearity, grid alignment, and resolution tests.	3	3	3	0	3	3	3	3	2.6
		CO 3	**Demonstrate practical skills** in QA testing for different imaging modalities, including X-ray generators and tubes, image receptors, fluoroscopy, mammography, and computed tomography systems.	3	3	3	0	3	3	3	3	2.6
		CO 4	**Apply safe operation procedures** for radiology equipment, including preventive care, cleaning, and maintenance of cassettes, screens, processors, and digital image receptors.	3	3	3	0	3	3	3	3	2.6
		CO 5	**Implement radiation safety measures** during QA activities to protect patients, staff, and the public from unnecessary exposure.	3	3	3	0	3	3	3	3	2.6
		CO 6	**Ensure compliance with regulatory and professional standards** for quality control in diagnostic imaging facilities.	0	3	3	0	3	3	3	3	2.3
		AVERAGE		2.5	3.0	3.0	0.0	2.5	3.0	2.5	3.0	2.4
	MMRIT Directed Clinical Education – IV (MMRIT 116 CP)	CO 1	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.	3	3	2	2	1	3	3	3	2.5
		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.	1	3	3	3	3	3	3	3	2.8

		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.	1	3	2	2	1	3	3	3	2.3
		AVERAGE		1.7	3.0	2.3	2.3	1.7	3.0	3.0	3.0	2.5
	RESEARCH PROJECT / DISSERTATION (MMRIT 113)	CO 1	**Identify and formulate a relevant research problem** in the field of medical radiology and imaging technology through a thorough review of literature and clinical observations.	3	2	0	0	3	3	3	3	2.1
		CO 2	**Apply theoretical and clinical knowledge** to develop innovative solutions or improvements in imaging procedures, patient safety, image quality, or radiologic technology.	3	0	0	0	3	3	3	3	1.9
		CO 3	**Write and present a comprehensive research dissertation** in a structured academic format, including introduction, review of literature, methodology, results, discussion, conclusion, and references.	0	0	0	0	3	3	3	3	1.5
		CO 4	**Demonstrate critical thinking and problem-solving skills** by defending the research findings during viva voce or presentation sessions.	0	0	0	0	3	3	3	3	1.5
		CO 5	**Contribute to the scientific community** by producing research work that may lead to publication, presentation at conferences, or implementation in clinical practice.	0	0	0	0	3	3	3	3	1.5
		AVERAGE		1.2	0.4	0.0	0.0	3.0	3.0	3.0	3.0	1.7