DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,

CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A+' Grade

CIRCULAR NO.SS/ Sci & Tech./ Diploma /12 /2025.

It is hereby inform to all concerned that, on recommendation of the Dean, Faculty of Science & Technology **Academic Council at its meeting held on 21 July, 2025 has been accepted as per National Education Policy-2020" the following *New Two Year Program 1. Medical Laboratory Technology (DMLT), 2. Medical Imaging Technology (DMLT), of under* the Faculty of Science & Technology run at the Department, Entrepreneurship and Skill Development Centre (ESDC), Deen Dayal Upadhyay Kaushal Kendra, Dr. Babasaheb Ambedkar Marathwada University as appended herewith.**

This is effective from the Academic Year 2025-26 onwards under the Faculty of Science & Technology.

All concerned are requested to note the contents of the circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,
Chhatrapati Sambhajinagar-431004.
Ref. No. S S/Sci & Tech/Diploma./2025-26/
Date: 31/ 07/ 2025 /1408-10

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Deputy Registrar,
Syllabus Section

Copy forwarded and Information to necessary action:-

1] **The Director, Department, Entrepreneurship and Skill Development Centre (ESDC), Deen Dayal Upadhyay Kaushal Kendra, Dr. Babasaheb Ambedkar Marathwada University.**

2] **The Director, Board of Examination & Evaluation,**

3] **The Director,** University Network & Information Centre, UNIC, with a **request to upload this circular on University Website.**
Dr. Babasaheb Ambedkar Marathwada University **Chhatrapati Sambhajinagar.**

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

Entrepreneurship and Skill Development Centre

'Diploma in Medical Imaging Technology'

(Two Year Program)

Course Structure

(Based on NEP -2020)

Effective from 2025-26

PREFACE

The National Education Policy (NEP) 2020 has introduced significant reforms aimed at transforming the education landscape in India. Here's how NEP 2020 intersects with skill education:

1. **Multidisciplinary Education**: NEP 2020 emphasizes multidisciplinary education, encouraging students to pursue a broad range of subjects and skills. This approach promotes flexibility and enables students to develop diverse skill sets tailored to their interests and career goals.
2. **Holistic Development**: The policy advocates for holistic development, which includes not only academic learning but also social, emotional, and vocational skills. This holistic approach ensures that students are well-rounded individuals equipped to navigate various aspects of life and work.
3. **Vocational Education and Internships**: NEP 2020 places a strong emphasis on vocational education, integrating it into mainstream curriculum from an early age. The policy encourages hands-on learning experiences, internships, and apprenticeships to provide practical skills and real-world exposure to students.
4. **Focus on Critical Thinking and Problem-Solving**: NEP 2020 prioritizes the development of critical thinking, creativity, and problem-solving skills. These skills are essential for innovation and adaptability in a rapidly changing world and are integrated across all levels of education.
5. **Flexible Learning Pathways**: The policy promotes flexible learning pathways, allowing students to choose their own educational trajectories based on their interests, aptitudes, and aspirations. This flexibility enables students to explore diverse skill areas and tailor their education to suit their individual needs.
6. **Teacher Training and Professional Development**: NEP 2020 recognizes the importance of teacher training and professional development in enhancing the quality of education. The policy emphasizes continuous learning for teachers, equipping them with the knowledge and skills necessary to effectively nurture students' talents and abilities.
7. **Digital Education and Technology Integration**: The policy advocates for the integration of digital technology in education to enhance access, equity, and quality. Digital platforms and tools are leveraged to facilitate interactive learning experiences, skill development, and personalized instruction.

By aligning with the principles and objectives of NEP 2020, skill education in India is poised to undergo a transformative shift, fostering innovation, equity, inclusivity, and excellence in education. These contexts have remained as mainframe while developing this curriculum.

The University has adapted Outcome-based education (OBE) since 2017. OBE is widely adopted in educational systems globally due to student centric advantages. OBE provides clear and measurable learning objectives that help students focus and stay motivated. It emphasizes real-world skills, bridging the gap between academia and the workforce. Customized learning paths are possible, accommodating different learning styles and promoting inclusivity. OBE focuses on mastery and competency rather than seat time, encouraging deeper learning and retention of knowledge. Continuous improvement is encouraged through ongoing assessment and feedback. OBE promotes accountability and transparency, allowing stakeholders to monitor progress and evaluate educational programs. It equips students with skills needed for the globalized economy, fostering critical thinking and collaboration. Lifelong learning skills like self-directed learning and adaptability are developed, creating a culture of continuous improvement. Overall, OBE offers a holistic approach to education, emphasizing relevant skills, competencies, and attitudes crucial for success in today's ever-changing world.
The authorities of Dr. Babasaheb Ambedkar Marathwada University, CHHATRAPATI SAMBHAJINAGAR (M.S.), remaining aligned to accreditation standards of National Assessment and Accreditation Council, decided to opt for National Education and Policy and Outcomes Based Education (OBE). As the part of the decision, different meetings, workshops and presentations were held at the campus of university.

This document is the outcome such meetings and workshops held at university level and department level. The detailed document is designed from the standpoint of the immediate and long-time requirements of heath care industries, and transformed in to the framework of NEP with OBE. This is the first step towards the implementation of NEP with OBE in the university departments and affiliated colleges. The document will serve all stakeholders in the effective implementation of the curriculum. The OBE is continuous process for quality enhancement and it will go a long way in order to enhance the competencies and employability of the graduates/Post-graduates of the university departments and affiliated colleges.

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Two-Year Diploma in Medical Imaging Technology (DMIT) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts.

Medical Imaging Technology is a critical and continuously evolving field within modern healthcare, facilitating early and accurate diagnosis of a wide range of diseases and medical conditions. Medical Imaging Technologists (MITs), the trained professionals in this domain, play a pivotal role in clinical diagnosis by producing high-quality radiographic images that guide physicians in treatment planning and surgical decisions. Their proficiency ensures that imaging procedures are performed with utmost precision, safety, and ethical responsibility.

In India, where healthcare infrastructure is rapidly expanding—especially across semi-urban and rural areas—the demand for qualified imaging professionals is growing significantly. This makes the Two-Year Diploma in Medical Imaging Technology (DMIT) not just an academic credential but a timely and strategic response to the country's healthcare workforce needs. The DMIT program provides students with a robust foundation in radiographic techniques, anatomy and physiology, radiation safety, and imaging modalities such as X-ray, CT, MRI, and ultrasound. It blends theoretical learning with extensive hands-on clinical training to ensure that graduates are ready to meet real-world healthcare challenges with confidence and competence.

Importance of the Two-Year DMIT in the Indian Context

The relevance of this diploma program in the Indian healthcare landscape is multifaceted:

Bridging the Diagnostic Gap: India faces a significant shortage of trained medical imaging personnel. DMIT-trained professionals contribute to filling this gap by supporting early disease detection and reducing patient diagnosis time.

Affordable Skill Development: As a relatively short, focused, and cost-effective program, DMIT creates opportunities for students from diverse socio-economic backgrounds to pursue rewarding careers in healthcare imaging.

Support for Public Health and Emergency Services: Imaging technologists play a crucial role in trauma care, pandemic response, and preventive health screening—services that are increasingly vital in India's growing healthcare sector.

Employment Opportunities: Graduates of the DMIT program find employment in hospitals, diagnostic centres, trauma and emergency units, mobile imaging facilities, and public health campaigns, contributing to both primary care and specialized medical services.

Alignment with the National Education Policy (NEP) 2020

The National Education Policy (NEP) 2020 emphasizes vocational education, skill-based training, and flexible academic pathways to meet the evolving needs of India's workforce and economy. The DMIT program is closely aligned with these forward-looking goals in several ways:

Vocational Orientation: The DMIT is an employment-oriented course that focuses on job-ready skills and applied knowledge, aligning with NEP's vision of integrating vocational training into mainstream education.

Multiple Entry and Exit Options: Reflecting NEP's flexible and modular approach, the diploma structure allows students the option to exit with a certification and re-enter education or employment pathways based on personal needs.

Skill-Based Curriculum: The program emphasizes experiential learning and competency development over rote memorization, preparing students for clinical practice, emergency situations, and new technologies in diagnostic imaging.

Inclusivity and Access: NEP advocates for inclusive education that reaches underserved and marginalized populations. The DMIT program contributes to this vision by being accessible, affordable, and adaptable to regional healthcare needs.

As detailed above, the **Two-Year Diploma in Medical Imaging Technology** is more than just an educational qualification—it is a foundational pillar for developing a resilient, accessible, and high-quality diagnostic imaging infrastructure in India. This program imparts essential technical skills, ensures a continuous supply of qualified imaging professionals to the healthcare system, and contributes significantly to public health, early disease detection, and patient management.

Aligned with the visionary goals of the **National Education Policy 2020**, the DMIT program exemplifies a skill-based, inclusive, and future-ready approach to healthcare education.

As India moves toward achieving universal healthcare and enhanced medical outcomes, the proposed **Two-Year Diploma in Medical Imaging Technology** plays a critical role in building the human capital necessary for this transformation—empowering individuals with career-ready skills and strengthening the nation's diagnostic capabilities in both urban and rural healthcare settings.

Programme Educational Objectives (PEOs):

For the Two-Year Diploma in Medical Imaging Technology Curriculum under the National Education Policy 2020

1. **Mastery of Discipline-Specific Knowledge:**

   Diploma holders in Medical Imaging Technology will demonstrate a strong understanding of core principles, techniques, and safety standards in radiology and imaging sciences. They will be capable of operating modern imaging equipment and contributing effectively to diagnostic and therapeutic healthcare services.

2. **Interdisciplinary Proficiency:**

   Graduates will integrate knowledge from anatomy, physiology, physics, and clinical sciences to perform and interpret imaging procedures. They will approach healthcare challenges with a comprehensive understanding of cross-disciplinary practices and patient-centered care.

3. **Critical Thinking and Analytical Skills:**

   Diploma holders will cultivate sharp analytical and critical thinking abilities, enabling them to assess imaging outcomes, identify abnormalities, and troubleshoot technical issues. They will apply evidence-based reasoning to ensure diagnostic accuracy and operational efficiency.

4. **Leadership and Innovation:**

   Graduates will exhibit leadership potential and an innovative mindset, ready to take initiative in clinical settings, adopt emerging imaging technologies, and promote quality improvement in healthcare delivery systems.

5. **Global Citizenship and Cultural Sensitivity:**

   Diploma holders will develop an awareness of global healthcare trends and demonstrate cultural competence, ensuring ethical, respectful, and inclusive patient care across diverse populations. They will actively contribute to collaborative and multicultural healthcare environments.

Program Outcomes (PO):

The Program Outcomes are the skills and knowledge which the students have at each exit level/at the time of graduation. These Outcomes are generic and are common to all exit levels mentioned in the programme structure. Diploma holders are expected to –

Apply Fundamental Knowledge of Medical Imaging

Demonstrate a strong understanding of radiographic principles, imaging modalities (e.g., X-ray, CT, MRI, Ultrasound), and patient care, ensuring the safe and effective application of imaging technologies in clinical settings.

Perform Diagnostic Imaging Procedures Safely and Accurately

Operate imaging equipment with precision, ensuring high-quality diagnostic images. Perform imaging procedures using appropriate techniques and safety protocols to support accurate diagnoses and patient care.

Assist in Patient Care and Clinical Support Services

Monitor and manage patient positioning and comfort during imaging procedures. Assist healthcare professionals in providing clinical support by ensuring proper imaging techniques while prioritizing patient safety.

Interpret Medical Imaging Data for Diagnosis and Treatment Planning

Assist in analyzing and interpreting basic imaging results, collaborating with radiologists and healthcare teams to aid in diagnosis, treatment planning, and follow-up care.

Ensure Adherence to Infection Control and Safety Protocols

Follow strict infection control guidelines, proper sterilization techniques, and biomedical waste management to protect patients and healthcare staff during imaging procedures.

Demonstrate Ethical and Professional Conduct

Exhibit ethical behavior by respecting patient confidentiality, maintaining professional standards, and understanding the legal and cultural aspects of medical imaging practice in diverse clinical environments.

Communicate Effectively in Clinical Settings

Communicate clearly and compassionately with patients, caregivers, and healthcare teams, ensuring that instructions are understood and patient care is coordinated effectively throughout imaging procedures.

Collaborate in Multidisciplinary Healthcare Teams

Function effectively as part of a healthcare team, demonstrating leadership, cooperation, and adaptability while working with physicians, nurses, and other healthcare professionals to deliver high-quality patient care.

Maintain Accurate Medical Imaging Records

Ensure that all imaging documentation and patient records are accurate, up-to-date, and comply with healthcare regulations, facilitating appropriate follow-up and continuity of care.

Engage in Lifelong Learning and Professional Development

Commit to continuous learning, staying abreast of technological advancements, new imaging modalities, and evidence-based practices to maintain competency in a rapidly evolving medical imaging field.

Program Specific Outcomes (PSO):

Diploma holders in Medical Imaging Technology are expected to:

1. **Apply Domain-Specific Knowledge in Medical Imaging**

   Utilize fundamental knowledge in medical imaging techniques such as X-ray, CT, MRI, and ultrasound to perform diagnostic imaging procedures, ensuring accurate image acquisition and contributing to clinical decision-making.

2. **Operate Modern Imaging Equipment and Systems**

   Effectively use advanced medical imaging technologies, including imaging systems, software, and related diagnostic tools, to conduct imaging procedures. Graduates will demonstrate proficiency in handling complex imaging devices, ensuring accurate results, quality control, and adherence to safety standards.

Eligibility:

XII Science/Commerce/Arts or equivalent from any recognized Board/Institution are eligible for registration/ admission to first year (Semester I) of DMIT program.

Exit Options:

The programme allows exit of a student in an intermediate stage, on successful employment. Scopes will be there for further continuation of study. The other wise exit options will be as follows-

Exit Point	*Duration*	*Diploma / Degree to be Offered*
First exit	After 1 yr.	Certificate in Medical Laboratory Technology
Second exit	After 2 yrs.	Diploma in Medical Laboratory Technology

Choice Based Credit System (CBCS):

The choice-based credit system is going to be adopted. This provides flexibility to make the system more responsive to the changing needs of our students, the professionals and society. It gives greater freedom to students to determine their own pace of study. The credit-based system also facilitates the transfer of credits.

- Students will have to earn 44 credits for the award of one year Certificate in Medical Laboratory Technology
- Students will have to earn 88 credits for the award of two year Diploma in Medical Laboratory Technology

Admission / Promotion Process:

XII Science/Commerce/Arts or equivalent from any recognized Board/Institution are eligible for registration/ admission to first year (Semester I) of DMIT program.

A candidate who has sought admission to Semester – I shall be admitted to Semester – II automatically. A candidate who has passed 75% of the papers at First Year (First and Second Semesters together) examinations shall be allowed to take admissions in third semester.

For obtaining Diploma in Medical Imaging Technology, a student will have to complete all semesters successfully within maximum 04 years/08 semesters. The program also offers multiple exit/entry. Students can exit after completion of one year and can enter into the system (subsequent year) with 3 years from the date of first time registration.

Dropout students will be allowed to register for respective semester as and when the concerned courses are offered by the department, **HOWEVER HE / SHE SHOULD NOT EXCEED MORE THAN TWICE THE DURATION OF THE COURSE FROM THE DATE OF FIRST REGISTRATION AT PARENT DEPARTMENT / COLLEGE.** The admission of the concerned student will be automatically cancelled if he / she fails to complete the DMLT program within a period of maximum four years / eight semesters.

Credit-to-contact hour Mapping:

(a) One Credit would mean equivalent of 15 contact hours for theory lecture.

(b) For lab course/ workshops/internship/field work/project, the credit weightage for equivalent hours shall be 50% that for lectures /workshop.

(c) For self- learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

Attendance:

Students must have 75 % of attendance in each course for appearing examination otherwise he / she will not be strictly allowed for appearing the examination of each course. Frequent absence from regular theory/Laboratory course may lead to disqualification from continuous assessment test (CAT) process in respective subject.

Departmental Committee:

The Departmental Committee (DC) of the Centre will monitor smooth functioning of the program.

Results Grievances / Redressal Committee

Grievances / Redressal committee should be constituted in the department to resolve all grievances relating to the evaluation. The committee shall consist of Head of the department, the concerned teacher of a particular course and senior faculty member of Department of Committee. The decision of Grievances / Redressal committee will have to be approved by Department committee.

Evaluation Methods and Grading System:

Guidelines, as prescribed in Circular Bearing Reference No. SU/UG/ SCHEME EXAM/ NEP/ AC. AOB.I.04/2024/26092-105 dated 26-04-2024 by Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar (MS) will be strictly followed.

Syllabus of Two years Diploma in Medical Imaging Technology (DMIT) as per NEP 2020
Semester I

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Lab Course	Theory	Lab Course	
Major (Core) M1 Mandatory	MIT/DSC/T/100	Fundamentals of Anatomy	4		4		4
Major (Core) M2 Mandatory	MIT/DSC/T/101	Fundamentals of Physiology	4		4		4
Major (Core) M3 Mandatory	MIT/DSC/T/102	Fundamentals of Biochemistry	4		4		4
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	MIT/GE/OE/T/100	Human Anatomy in Medical Imaging.	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	MIT/SEC/T/100	Patient Safety and Infection Control	2		2		2
	MIT/SEC/T/101	Radiology Administration	2		2		
AEC, VEC, IKS	AEC/T/100	English (Common for all the faculty)	2		2		2+2 =4
	MIT/IKS/T/101	Choose any one from pool of courses	2		2		
OJT/ FP/CEP/CC/RP	MIT/CC/P/126	Health and Wellness (Common for all the faculty)		4		2	2
			13	18	13	09	22

Syllabus of Two years Diploma in Medical Imaging Technology (DMIT) as per NEP 2020
Semester II

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/ Week)		Credits Assigned		Total Credits
			Theory	Lab Course	Theory	Lab Course	
Major (Core) M4 Mandatory	MIT/DSC/T/150	Radiographic Techniques(Radio-imaging)	2		2		2+2=4
	MIT/DSC//P/176	Radiographic Techniques(Radio-imaging) Lab		4		2	
Major (Core) M5 Mandatory	MIT/DSC/T/151	Radiological Physics	2		2		2+2=4
	MIT/DSC/P/177	Radiological Physics Lab		4		2	
Major (Core) M6 Mandatory	MIT/DSC/T/152	Quality Assurance and Radiation Protection in Radiology	2		2		2+2=4
	MIT/DSC/P/178	Quality Assurance and Radiation Protection in Radiology Lab		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	MIT/GE/OE/T/150	Human Physiology in Medical Radiology.	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	MIT/VSC/T/150	OBS in X Ray department		4		2	2
	MIT/VSC/T/151	OBS in Mammography		4		2	
AEC, VEC, IKS	MIT/AEC/T/150	English (Common for all the faculty)	2		2		2+2 =4
	MIT/AEC/T/151	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	MIT/CC/P176	Yoga Education / Sports and Fitness (Common for all the faculty)		4		2	2
			13	18	13	09	22
Exit Option : Award of UG Certificate i with 44 credits and an additional 4 credits of core course / Internship OR continue with Major and Minor							

Syllabus of Two years Diploma in Medical Imaging Technology (DMIT) as per NEP 2020
Semester III

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Lab Course	Theory	Lab Course	
Major (Core) M7 Mandatory	MIT/DSC/T/200	Radiographic Techniques in Routine Procedure	2		2		4
	MIT/DSC/P/226	Radiographic Techniques in Routine Procedure Lab		4		2	
Major (Core) M8 Mandatory	MIT/DSC/T/201	Radiographic Techniques in Special Procedure	2		2		4
	MIT/DSC/P/227	Radiographic Techniques in Special Procedure Lab		4		2	
Minor	MIT/MN/T/200	Pathology Lab 1	2		2		4
	MIT/MN/T/201	Pathology Lab 2	2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	MIT/GE/OE/T/200	Human Biochemistry in Medical Imaging - Part 1	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	MIT/VSC/T/200	X ray Contrast Media	2		2		2
	MIT/VSC/T/201	Physics of Radiological Equipment	2		2		
AEC, VEC, IKS	MIT/AEC/T/200	English (Common for all the faculty)	2		2		2+2 =4
	MIT/AEC/T/201	Environmental Studies (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	MIT/CC/P/226	Field Project				2	2
			13	18	13	09	22

Syllabus of Two years Diploma in Medical Imaging Technology (DMIT) as per NEP 2020
Semester IV

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Lab Course	Theory	Lab Course	
Major (Core) M9 Mandatory	MIT/DSC/P/276	Radiographic techniques and Routine procedures Lab		8		4	4
Major (Core) M10 Mandatory	MIT/DSC/P/277	Special procedures (CT Scan and M.R.I.) Lab		8		4	4
Minor	MIT/MN/T/250	Pathology Lab 3	2		2		4
	MIT/MN/T/251	Blood Bank Practices	2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	MIT/GE/ OE/T/250	Human Biochemistry in Medical Imaging - Part 2	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	MIT/VSC /T/250	X-ray Contrast media Lab		4		2	2
	MIT/VSC/T/251	BMD Lab and Mammography Lab		4		2	
AEC, VEC, IKS	MIT/AEC/T/250	English (Common for all the faculty)	2		2		2+2 =4
	MIT/VEC/T/251	Environmental Studies (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	MIT/CC/P/278	Field Project		4		2	2
			13	18	13	09	22
OR							
The student has to complete 660 Hours internship in a hospital throughout the semester : 22 Credits							

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2025

DMIT SEMESTER - I

SYLLABUS

MIT/DSC/T/100 : Fundamentals of Anatomy

Total Credits : 04 **Total Contact Hours : 60 Hrs**

Maximum Marks : 50

Learning Objectives of the Course:

To provide fundamental concepts on -

1. Location and naming of bones, muscles, organs, blood vessels, and nerves on models, cadavers, or virtual dissections.
2. Describe the anatomical positioning of structures relative to each other using directional terms (e.g., anterior, posterior, medial). Conduct or observe dissections on specimens (human cadaver, animal models, or virtual), identifying structures and noting their functions.

Course Outcomes (COs) :

On completion of the course, students should be able to -

1. Accurately identify and label anatomical structures on models, diagrams, cadavers, or virtual platforms..
2. Explain the form, function, and spatial relationships of major organ systems using anatomical terms
3. Examine tissues and organs using microscopes and identify histological features related to organ function.
4. Use clear, correct anatomical language in lab reports, oral presentations, and collaborative discussions.

Module No.	Course Content	Contact Hours
I	**Basic Concepts, Cell and Tissue** 1.1 Human body as whole 1.2 Glands and cavities 1.3 Organs and Organ System 1.4 Cell Structure in detail 1.5 Identification of cell components 1.6 Tissue 1.7 Types of tissue+B349	**20 Hrs**
II	Cardiovascular Respiratory and Digestive System 2.1 Heart 2.2 Aorta and major blood vessels 2.3 Blood Circulation 2.4 Upper respiratory tract 2.5 Lower Respiratory tract 2.6 Digestive tract 2.7 Digestive accessory glands	**20 Hrs**
III	**Skeletal ,Muscular and Excretory system** 3.1 Axial Skeleton 3.2 Appendicular Skeleton 3.2 Types of Muscles	**20 Hrs**

	3.3 Kidney and Ureter 3.4 Urinary Bladder and urethra	

Text Books:

1. Phillip Snider, Terry Martin, Charles Welsh, and Cynthia Prentice-Craver," Laboratory Manual for Hole's Human Anatomy", 2024 (99th Edition)
2. Malgosia Wilk-Blaszczak," Human Anatomy Lab Manual", 2018
3. Michael G. Wood," Anatomy and Physiology Lab Manual featuring Martini Art', 2024 (7th Edition)

Reference Books:

1. Jodie Foster, Kendall Hunt, "Human Anatomy and Physiology Lab Manual Part I", 2022 (3rd Edition)

Online Reference:

1. https://uta.pressbooks.pub/anatomylab/?utm_source=chatgpt.com
2. https://www.pearson.com/en-us/subject-catalog/p/anatomy-and-physiology-lab-manual-featuring-martini-art/P200000011709/9780138252618

MIT/DSC/T/100 : Fundamentals of Physiology

Total Credits : 04 **Total Contact Hours : 60 Hrs**

Maximum Marks : 50

Learning Objectives of the Course:

To provide fundamental concepts on -

1. Physiological Principles
2. Basic functions of cells, tissues, organs, and systems in the human body.
3. Laboratory experiments to measure and observe functions such as muscle contraction, nerve impulse conduction, cardiovascular responses, and respiratory activity.

Course Outcomes (COs) :

On completion of this course, students should be able to -

1.Demonstrate Understanding of Physiological Mechanisms
2.Perform and Interpret Standard Physiological Experiments
3.Analyze and Evaluate Experimental Data

Module No	Course Content	Contact Hours
I	**General Physiology and Cell and tissues Physiology** 1.1 Homeostasis 1.2 Cell transport mechanism 1.3 Fluids 1.4 Transport process of cell	20 Hrs
II	**Cardiovascular System and Respiratory system** 2.1.Blood pressure 2.2. Heart Cardiac Impulse, Cardiac Cycle. 2.3. Cardiac output, Arterial Pulse 2.4 .Cardiac Action Potential	20 Hrs

	2.5 Cardiac Cycle. 2.6 Organization and Functions of respiratory System, Mechanism of Respiration 2.7 Transport of O2 and CO2 gases.	
III	**Digestive ,Endocrine and Nervous System** 3.1.Organization of digestive system, functions of various components, Salivary, Gastric, Pancreatic Secretion 3.2. Functions of liver, Small intestine and large intestine 3.3.Hormones 3.4.Hypothalamus 3.5.Anterior and posterior pituitary 3.6.Thyroid, Parathyroid 3.7.Pancreas, Adrenal Cortex 3.8.Organzaton of nervous system 3.9.Sensory System 3.10. Motor System 3.11.Brain 3.12.Autonomic Nervous system	**20 Hrs**

Text Books:

1. Dee Unglaub Silverthorn,,"Human Physiology: An Integrated Approach", 2020 (9th Edition)
2. D. L. Johnson, A. S. Polasky, J. L. H. Caputo,"Human Physiology: From Cells to Systems", 2021 (10th Edition)
3. David J. Whitmore,"Laboratory Manual for Physiology and Anatomy", 2019 (8th Edition)

Reference Books:

1. Walter F. Boron, Emile L. Boulpaep, "Medical Physiology: A Cellular and Molecular Approach", 2019 (4th Edition)
2. Connie Allen, Valerie Harper, "Laboratory Manual for Human Anatomy and Physiology", 2020 (12th Edition)

Online Reference:

1. https://www.wiley.com/en- us/ Laboratory+Manual + for+ Physiology+ and+ Anatomy %2C+8th+ Edition-p-9781118974399
2. https://www.pearson.com/en-us/subject-catalog/p/anatomy-and-physiology-lab-manual-featuring-martini-art/P200000011709/9780138252618

MIT /DSC/T/100 : Fundamentals of Biochemistry

Total Credits: 04 **Total Contact Hours : 60 Hrs.**

Maximum Marks : 50

Learning Objectives of the Course:

To provide fundamental concepts on -

1. Structure and Function of Biomolecules.
2. Chemical structure, properties, and biological functions of macromolecules such as proteins, carbohydrates, lipids, and nucleic acids.
3. Biochemical Techniques such as spectrophotometry, chromatography, electrophoresis, and enzyme assays.

Course Outcomes (COs) :

On completion of this course, students should be able to -

1. identify, isolate, and characterize major biomolecules (proteins, nucleic acids, carbohydrates, and lipids) using laboratory techniques like chromatography, electrophoresis, and spectrophotometry.
2. analyze enzyme-catalyzed reactions, determine enzyme activity, and calculate reaction rates using standard techniques, and apply this knowledge to understand enzyme mechanisms.
3. apply laboratory techniques to address clinical and diagnostic issues, such as analyzing blood samples for glucose or lipid levels and interpreting results.

Module No	Course Content	Contact Hours
I	**Basic Concept of Biochemistry, Introduction to Chemical Constituents of life, Biological Oxidation and Minerals** ATP-ADP cycle, electron transport chain, inhibitors and uncouplers. Importance of Some minerals Sodium, potassium, Calcium, Phosphorous, iron, copper, chloride and fluoride	20 Hrs.
II	**Units of measurements** SI units, Definitions, Conversions, Measurement of volumes, Strength, normality, molarity, molality Definitions, Mole, Molar and normal solutions (Preparations and standardization), pH (definition, Pka value, Example, importance of Henderson-hasslebalch equation), Buffer solutions (Definition, preparation of important solutions) pH Indicators (pH papers, universal and other indicators) pH Measurement Different methods (pH Paper, pH Meter, Principle of pH Meter, Structure, working and maintenance)	20 Hrs.
III	**Water Metabolism** Introduction to Water in the Human Body, Mechanisms of Water Balance and Regulation, Electrolyte Balance in Relation to Water, Disorders of Water Metabolism, Laboratory Investigations Related to Water Metabolism	20 Hrs.

Text Books:

1. U. Satyanarayana and U. Chakrapani, Essentials of Biochemistry, 2nd Ed., Elsevier, 2020.
2. Vasudevan D.M., Sreekumari S., Kannan Vaidyanathan, Textbook of Biochemistry for Medical Students, 8th Ed., Jaypee Brothers Medical Publishers, 2022.

3. Pankaja Naik, Biochemistry for Nurses, 2nd Ed., Jaypee Brothers Medical Publishers, 2011.

Reference Books:

1. Lehninger, Nelson & Cox, Lehninger Principles of Biochemistry, 8th Ed., W.H. Freeman and Co., 2021.
2. Harper's Illustrated Biochemistry, 32nd Ed., McGraw-Hill Education, 2017.
3. Debajyoti Das, Biochemistry, 18th Ed., Academic Publishers, 2019.

Online Reference:

1. https://www.elsevierhealth.com/satyanarayana-essentials-of-biochemistry-9788131262643.html
2. https://www.jaypeebrothers.com

MIT /SEC/T/100: Patient Safety and Infection Control

Total Credits: 02
Maximum Marks: 25

Total Contact Hours: 30 Hrs.

Learning Objectives of the Course:

This will help learners to

1. Understand the significance of patient safety.
2. Describe safety frameworks & human factors
3. Cultivate a safety culture
4. Master safe practice in high-risk areas.
5. Enhance communication with patients/families.

Course Outcomes (COs) :

After completion of this course, students should be able to:

1. Articulate why patient safety matters and describe major risks.
2. Identify safety hazards in their environments and conduct risk assessments.
3. Incorporate teamwork and structured communication to safeguard patients.
4. Embed patient and family perspectives in safety activities.

Module No	Course Content	Contact Hours
I	**1.1Communicating Effectively:** Involving patients as partners in healthcare, Communicating risks, Obtaining Consent, Being culturally respectful & Knowledgeable	10 Hrs.

	1.2 Adverse events & near misses : Introduction & explanation to the terms, Adverse event forms	
II	**2.1 Working Safely :** Being a team player, Understanding human factors, Providing continuity of care **2.2 Medication safety :** Wrong site, Wrong patient, Wrong technique, Wrong dose, Wrong Medicine	10 Hrs.
III	**3.1 Why Infection control spread of infection control ways :** Care of skin, Hand hygiene, Protective apparel, Procedure for safe handling of sharps, Procedure for safe disposal of sharps, Management of blood and body fluid spills, Linen management (use & disposal). **3.2 PPE :** Hand washing, Gloves, Masks, goggles & face masks, Gowns, Patient care equipment, Environmental cleaning, Management of Sharps.	10 Hrs.

Text Books:

1. Text book of Patient Safety and Clinical Risk Management, Liam Doaldson, Walter Riccardo, year 2021.
2. Essentials of Hospital Infection Control, Apurba S. Sastry & Deepashree R. , Year 2024.

Reference Books:

1. Essentials of Hospital Infection Control, by Apurba S. Sastry & R. Deepashree, Year 2024.
2. Prevention of Healthcare – associated Infection: Infection Prevention and Control by Yatin Mehta & Usha K. Baveja Year 2021.
3. Applied Microbiology and Infection Control Practices for Nurses by Dr. Kannan, Year 2023

Online Reference:

1. https://qps.nhsrcindia.org/patient-safety
2. http://www.who.int/health-topics/infection-prevention-and Control

MIT /SEC/T/101: Radiology Administration

Course Type: Core (Diploma in Medical Imaging Technology)
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 25

Learning Objectives of the Course

The course aims to:

1. Introduce the organizational structure and workflow in a radiology department.
2. Familiarize students with scheduling, record keeping, and communication in clinical imaging services.
3. Develop understanding of equipment inventory, maintenance, and safety protocols.
4. Prepare students to assist in quality assurance, radiation safety, and compliance with legal and ethical standards.

Course Outcomes (COs)

After completion of this course, students should be able to:

1. Describe the administrative structure and day-to-day functioning of a radiology department.
2. Maintain patient records, appointment logs, and imaging reports systematically.
3. Manage imaging equipment, track inventory, and adhere to preventive maintenance protocols.
4. Apply quality control measures and comply with legal, ethical, and radiation safety norms in radiology practice.

Module No.	Course Content	Contact Hours
I	**Organization and Operation of Radiology Department**: Departmental layout, roles of radiology personnel, scheduling of procedures, patient preparation and documentation, interdepartmental communication, SOPs.	10 Hrs.
II	**Equipment, Inventory, and Maintenance Management**: Types of imaging equipment (basic classification), log books, annual maintenance contracts (AMC), equipment breakdown handling, accessories tracking, radiation signage and labeling.	10 Hrs.
III	**Quality Assurance, Safety, and Legal Considerations**: Radiation protection principles, legal aspects of radiological procedures, patient consent, ethical practice, AERB and NABH guidelines, quality control tests (introductory), and documentation.	10 Hrs.

Text Books

1. **Stewart C. Bushong**, *Radiologic Science for Technologists: Physics, Biology, and Protection*, 11th Ed., Elsevier, 2020.
2. **A. K. Khanna**, *Essentials of Hospital Support Services: Radiology and Imaging*, Jaypee Brothers, 2017.

Reference Books

1. **J. William Charboneau**, *Basic Radiological Procedures and Administration*, McGraw-Hill Education, 2016.
2. **Mahadevappa Mahesh**, *The Essential Physics of Medical Imaging*, 4th Ed., Lippincott Williams & Wilkins, 2018.

Online References

1. https://www.aerb.gov.in
2. https://www.nabh.co

MIT /GE/OE/T/100: Human Anatomy in Medical Imaging

Course Type: Open Elective
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 25

Learning Objectives of the Course

The course aims to:

1. Familiarize learners with basic anatomical regions and body planes.
2. Introduce key imaging modalities such as X-ray, ultrasound, CT, and MRI.
3. Help identify major organs and skeletal structures as seen in common radiological images.
4. Develop basic interpretive skills for understanding clinical imaging in a simplified manner.

✓ Course Outcomes (COs)

After Completion of the Course, students should be able to:

1. Understand the orientation of body planes and locate major anatomical structures.
2. Identify basic skeletal and soft tissue landmarks as seen in common imaging techniques.
3. Recognize normal radiographic appearances of major body organs.
4. Appreciate the role of imaging in medical diagnostics and decision-making.

Module No.	Course Content	Contact Hours
I	**Introduction to Human Anatomy and Imaging Modalities**: Overview of anatomical terms, planes, and directions. Introduction to imaging techniques: X-ray, ultrasound, CT scan, and MRI. Relevance of imaging in diagnostics.	10 Hrs.
II	**Head, Chest, and Abdomen in Imaging**: Basic skeletal landmarks (skull, ribs, spine). Soft tissue anatomy of the brain, lungs, heart, liver, and stomach. Recognizing normal appearances in X-ray, CT, and MRI.	10 Hrs.
III	**Limbs, Pelvis, and Reproductive Organs in Imaging**: Anatomy of upper and lower limbs, pelvic bones, bladder, uterus, and testis. Understanding typical ultrasound and radiographic views of these	10 Hrs.

Module No.	Course Content	Contact Hours
	regions. Introduction to contrast studies (IVP, Barium studies – overview only).	

Text Books

1. **Marios Loukas, Brion Benninger**, *Anatomy for Radiologic Imaging*, CRC Press, 2019.
2. **Anne M. R. Agur, Arthur F. Dalley**, *Grant's Atlas of Anatomy*, 14th Ed., Wolters Kluwer, 2016.

Reference Books

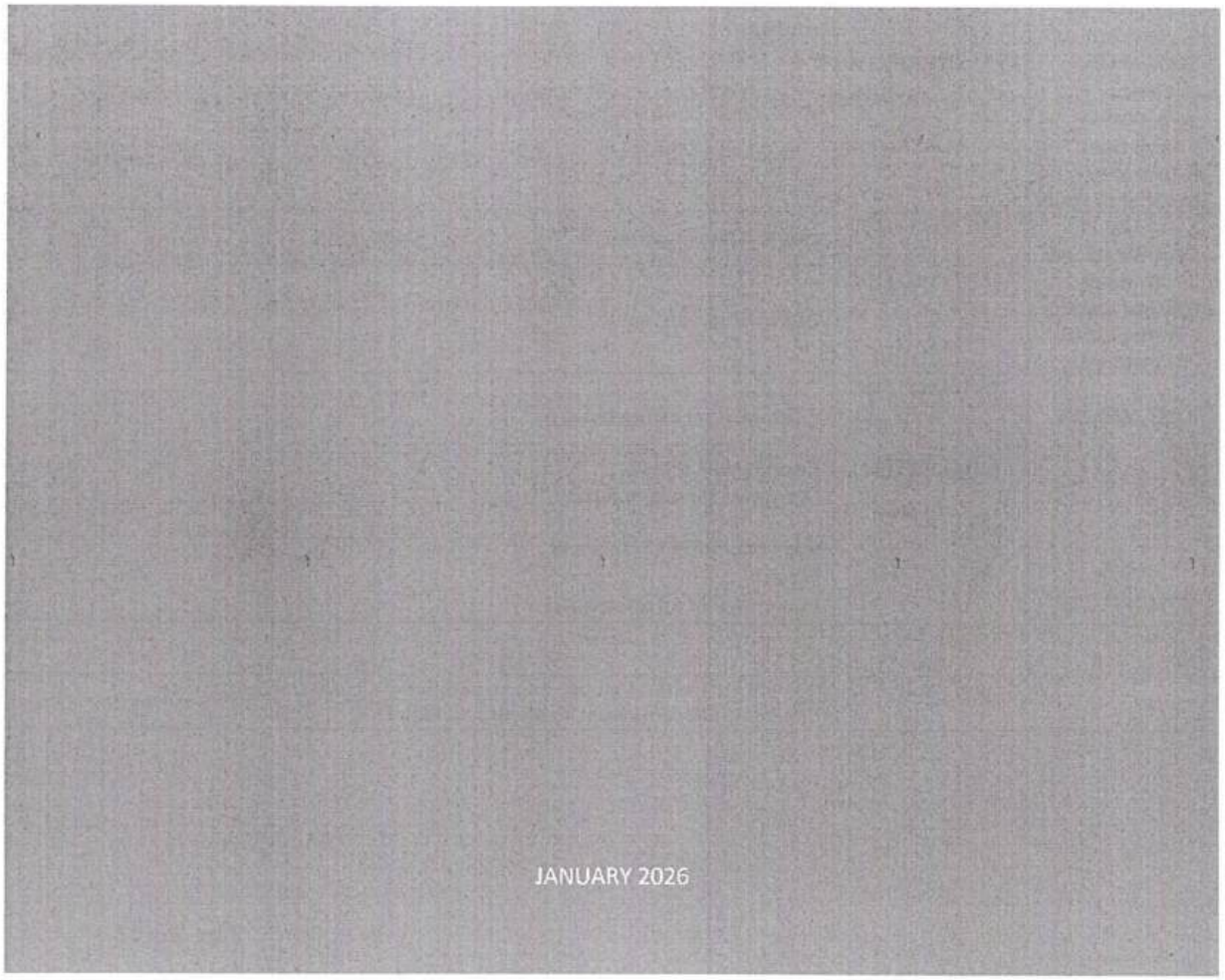
1. **Gretchen M. Lentz et al.**, *Imaging Atlas of Human Anatomy*, 5th Ed., Elsevier, 2021.
2. **R. S. Snell**, *Clinical Anatomy by Regions*, 10th Ed., Lippincott Williams & Wilkins, 2018.

Online References

1. https://www.imaios.com/en/e-Anatomy
2. https://radiopaedia.org

Dr. Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar
Entrepreneurship and Skill Development Centre

DIPLOMA IN MEDICAL IMAGING TECHNOLOGY (SYLLABUS FOR SEMESTER II)



JANUARY 2026

Two years Diploma in Medical Imaging Technology (DMIT) as per NEP 2020

Semester II Course Structure and Syllabus

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/ Week)		Credits Assigned		Total Credits
			Theory	Lab Course	Theory	Lab Course	
Major (Core) M4 Mandatory	MIT/DSC/T/150	Radiographic Techniques(Radio-imaging)	2		2		2+2=4
	MIT/DSC//P/176	Radiographic Techniques(Radio-imaging) Lab		4		2	
Major (Core) M5 Mandatory	MIT/DSC/T/151	Radiological Physics	2		2		2+2=4
	MIT/DSC/P/177	Radiological Physics Lab		4		2	
Major (Core) M6 Mandatory	MIT/DSC/T/152	Quality Assurance and Radiation Protection in Radiology	2		2		2+2=4
	MIT/DSC/P/178	Quality Assurance and Radiation Protection in Radiology Lab		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	MIT/GE/OE/T/150	Human Physiology in Medical Radiology.	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	MIT/VSC/T/150	OBS in X Ray department		4		2	2
	MIT/VSC/T/151	OBS in Mammography		4		2	
AEC, VEC, IKS	MIT/AEC/T/150	(Common for all the faculty)	2		2		2+2 =4
	MIT/AEC/T/151	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	MIT/CC/P176	Yoga Education / Sports and Fitness (Common for all the faculty)		4		2	2
			13	18	13	09	22
Exit Option : Award of UG Certificate i with 44 credits and an additional 4 credits of core course / Internship OR continue with Major and Minor							

MIT /DSC/T/150: Basic Radiographic Techniques (Radio imaging)

Course Type: TH; Core
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 50

Learning Objectives of the Course

The course aims to deliver:

1. Principles of radiographic image formation
2. Basics on conventional, computed, and digital radiography systems
3. Knowledge on exposure and geometric factors to improve image quality
4. Digital image processing and display systems understanding
5. Operational ideas on radiation safety, QA/QC, and dose optimization

Course Outcomes (COs)

After completion of this course, students should be able to:

1. **CO1:** Explain fundamentals of radiographic image formation
2. **CO2:** Describe conventional image receptors and exposure factors
3. **CO3:** Compare CR and DR imaging systems
4. **CO4:** Apply basic digital image processing techniques
5. **CO5:** Understand PACS, QA/QC, and radiation dose management

Unit No	Course Content	Contact Hours
Unit 1	**Basics of Radiographic Image Formation & Conventional Systems** 1.1. Principles of radiographic image formation 1.2. X-ray properties, attenuation, primary & secondary radiation 1.3. Image quality: density, contrast, resolution, noise 1.4. Exposure factors: kVp, mA, time, mAs, reciprocity law 1.5. Geometric factors: SID, OID, focal spot, distortion 1.6. X-ray film: structure, emulsion, latent image 1.7. Characteristic curve (H&D), film properties & limitations 1.8. Intensifying screens, cassettes, grids, artifacts	10 Hrs.
Unit 2	**Computed Radiography (CR) & Digital Radiography (DR)** 2.1 Limitations of conventional radiography 2.2 Introduction to CR: imaging plates, readers, laser scanning 2.3 CR image formation, exposure indicators, artifacts, care 2.4 Introduction to DR and flat panel detectors 2.5 Indirect (CsI, Gd_2O_2S) and direct (a-Se) detectors	10 Hrs.

Unit No	Course Content	Contact Hours
	2.6 Image acquisition process, advantages & limitations of DR	
Unit 3	**Digital Image Processing, PACS & Radiation Safety** 3.1 Digital image processing: ADC, preprocessing, post-processing 3.2 Windowing, leveling, image enhancement 3.3 Display monitors, viewing conditions, calibration 3.4 PACS, RIS, DICOM standards 3.5 Image storage, transmission & workflow 3.6 Quality assurance & quality control in CR/DR 3.7 Patient dose indicators (EI, DI, DAP) 3.8 ALARA principle & radiation detectors	10 Hrs.

MIT /DSC/P/176: Basic Radiographic Techniques (Radio imaging) Lab

Course Type: LAB; Core
Total Credits: 02 **Total Contact Hours**: 60 Hrs.
Maximum Marks: 50

1	Identification of X-ray equipment, accessories, and image receptors	4
2	Demonstration of radiographic image formation	5
3	Effect of exposure and geometric factors on image quality	6
4	Handling of radiographic films, intensifying screens, cassettes, and grids	5
5	Computed Radiography (CR): system identification, image acquisition, and artifacts	6
6	Digital Radiography (DR): system identification, image acquisitio, exposure index, and artifacts	6
7	Digital image processing: windowing and levelling	4
8	Image display and evaluation	4
9	PACS image storage and retrieval	4
10	Basic quality control tests for CR and DR	5
11	Radiation dose indicators and radiation protection practices	4
12	Demonstration of laser imager and dry film handling	4
13	Identification of radiation detectors	3

Text Books

1. Bushberg J.T. et al., *The Essential Physics of Medical Imaging*, Lippincott Williams & Wilkins
2. Carlton R.R. & Adler A.M., *Principles of Radiographic Imaging*, Cengage Learning

Reference Books

1. Fauber T.L., *Radiographic Imaging and Exposure*, Elsevier
2. Bushong S.C., *Radiologic Science for Technologists*, Elsevier
3. Sprawls P., *Physical Principles of Medical Imaging*, Aspen

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Online References

1. Radiopaedia: https://radiopaedia.org
2. IAEA Radiation Protection of Patients: https://www.iaea.org
3. Image Wisely: https://www.imagewisely.org
4. NCBI Medical Imaging Resources: https://www.ncbi.nlm.nih.gov

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MIT /DSC/T/151: Radiology Physics

Course Type: TH; Core
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 50

Learning Objectives of the Course

The course aims to provide understanding of:

1. The concept and importance of quality assurance in radiology
2. The routine quality control and equipment maintenance procedures
3. The radiation protection principles and safety practices
4. The occupational health hazards in imaging departments
5. The medico-legal aspects and medical record keeping
6. The biomedical waste management in radiology departments

Course Outcomes (COs)

After completion of this course, students should be able to:

1. **CO1:** Explain quality assurance and quality control activities in radiology
2. **CO2:** Perform basic maintenance checks and care of radiology equipment
3. **CO3:** Apply radiation protection principles and ALARA practices
4. **CO4:** Identify occupational hazards and adopt safe work practices
5. **CO5:** Maintain proper medical records and follow medico-legal guidelines
6. **CO6:** Practice safe biomedical waste segregation and disposal in radiology

Unit No.	Course Content	Contact Hours
Unit 1	**Basic Physics, Mathematics & Electricity** 1.1 Physical quantities and units 1.2 Motion, force, work, energy, and waves 1.3 Basic applied mathematics: algebra, equations, logarithms, graphs, statistics 1.4 Electricity: current, voltage, resistance 1.5 Ohm's law and electrical power 1.6 Basics of magnetism and electromagnetic induction	10 Hrs.
Unit 2	**Electromagnetic Radiation & X-ray Production** 2.1 Alternating current (AC) and direct current (DC) 2.2 Rectification and transformers 2.3 Step-up and step-down transformers in X-ray circuit 2.4 Electromagnetic radiation: nature and propertie 2.5 Electromagnetic spectrum 2.6 Relationship between wavelength, frequency, and energy 2.7 X-rays and gamma rays **2.8 Production of X-rays:** 2.8.1 X-ray tube and components 2.8.2 Thermionic emission 2.8.3 Target and focal spot 2.8.4 Bremsstrahlung and characteristic radiation	10 Hrs.
Unit 3	**Radiation Interaction, Measurement & Protection** 3.1 Interaction of radiation with matter: 3.1.1 Photoelectric effect 3.1.2 Compton scattering 3.1.3 Pair production 3.1.4 Attenuation 3.2 Basics of radioactivity: 3.1.5 Atomic structure 3.1.6 Types of radioactive decay 3.1.7 Half-life and units 3.3 Measurement of radiation: 3.3.1 Exposure, absorbed dose, equivalent dose 3.3.2 Radiation detectors: ionization chamber, GM counter, scintillation detector 3.4 Radiation protection: 3.4.1 Biological effects of radiation 3.4.2 Deterministic and stochastic effects 3.4.3 ALARA principle 3.4.4 Dose limits, shielding, and safety practices 3.4.5 AERB regulations	10 Hrs.

Unit No.	Course Content	Contact Hours
MIT /DSC/P/177: Radiology Physics Lab **Course Type**: LAB; Core **Total Credits**: 02 **Total Contact Hours**: 60 Hrs. **Maximum Marks**: 50		
1	Orientation to QA program in Radiology Department	3
2	Identification of QA & QC tools used in radiology	3
3	Daily, weekly & monthly QC checks of X-ray equipment	4
4	X-ray machine warm-up procedure & operational checks	4
5	Inspection and care of CR/DR cassettes & image receptors	4
6	Identification and use of radiation protective devices	4
7	Equipment maintenance logbook & service record demonstration	4
8	Identification of occupational hazards in radiology	2
9	Demonstration of safe work practices & ergonomics	2
10	Measurement of radiation levels using survey meter	4
11	Demonstration of personal monitoring devices (TLD, film badge)	4
12	Shielding assessment in radiology rooms (walls, doors, control panels)	4
13	Documentation and reporting of QA/QC tests	4

Text Books

1. Bushong S.C., *Radiologic Science for Technologists*, Elsevier
2. Carlton R.R. & Adler A.M., *Principles of Radiographic Imaging*, Cengage Learning

Reference Books

1. Bushberg J.T. et al., *The Essential Physics of Medical Imaging*, Lippincott Williams & Wilkins
2. Fauber T.L., *Radiographic Imaging and Exposure*, Elsevier
3. Seeram E., *Radiation Protection in Radiography*, Elsevier

Online References

1. AERB (Atomic Energy Regulatory Board): https://www.aerb.gov.in
2. IAEA – Radiation Protection of Patients: https://www.iaea.org
3. WHO – Radiation Safety in Medical Imaging: https://www.who.int
4. Radiopaedia: https://radiopaedia.org

MIT /DSC/T/152: Quality Assurance and Radiation Protection in Radiology

Course Type: TH; Core
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 50

Learning Objectives of the Course

The course aims to provide:

1. Understanding of the concept and importance of quality assurance in radiology
2. Concepts routine quality control procedures for radiology equipment
3. Concepts on safe handling and maintenance practices of imaging equipment
4. Understanding of occupational hazards and radiation protection principles
5. Concepts on biomedical waste management and radiation safety procedures

Course Outcomes (COs)

After completion of this course, students should be able to:

1. **CO1:** Explain quality assurance and quality control activities in radiology
2. **CO2:** Perform basic quality control tests of X-ray and imaging equipment
3. **CO3:** Demonstrate safe use of radiation protection devices
4. **CO4:** Identify occupational hazards and apply safety measures
5. **CO5:** Practice proper biomedical waste segregation and documentation

Unit No.	Course Content	Contact Hours
Unit 1	**Introduction to Quality Assurance in Radiology** 1.1 Concept and importance of quality assurance (QA) 1.2 Quality assurance vs quality control 1.3 QA activities in radiology department 1.4 Role of radiographers in QA programs	10 Hrs.
Unit 2	**Maintenance and Care of Radiology Equipment** 2.1 Preventive and corrective maintenance 2.2 Daily, weekly, and monthly equipment checks 2.3 Care of X-ray machines, CR/DR systems, and accessories 2.4 Equipment performance monitoring	10 Hrs.

Unit No.	Course Content	Contact Hours
Unit 3	**Occupational Health and Safety** 3.1 Occupational hazards in radiographic and imaging technology 3.2 Physical, chemical, and biological hazards 3.3 Ergonomic issues and workplace safety 3.4 Stress management and personal protective measures	10 Hrs.

MIT /DSC/P/178: Quality Assurance and Radiation Protection in Radiology Lab

Course Type: LAB; Core
Total Credits: 02 **Total Contact Hours**: 60 Hrs.
Maximum Marks: 50

1	Orientation to QA program in Radiology Department	3
2	Identification of QA & QC tools used in radiology	3
3	Daily, weekly & monthly QC checks of X-ray equipment	4
4	X-ray machine warm-up procedure & operational checks	4
5	Inspection and care of CR/DR cassettes & image receptors	4
6	Identification and use of radiation protective devices	4
7	Equipment maintenance logbook & service record demonstration	4
8	Identification of occupational hazards in radiology	2
9	Demonstration of safe work practices & ergonomics	2
10	Measurement of radiation levels using survey meter	5
11	Demonstration of personal monitoring devices (TLD, film badge)	4
12	Biomedical waste segregation & color coding in radiology	4
13	Documentation of radiation safety and QA records	3

Text Books

1. Bushong S.C., *Radiologic Science for Technologists*, Elsevier
2. Fauber T.L., *Radiographic Imaging and Exposure*, Elsevier

Reference Books

1. Carlton R.R. & Adler A.M., *Principles of Radiographic Imaging*, Cengage Learning
2. Bushberg J.T. et al., *The Essential Physics of Medical Imaging*, Lippincott Williams & Wilkins
3. Sprawls P., *Physical Principles of Medical Imaging*, Aspen Publishers

Online References

1. AERB (India): https://www.aerb.gov.in
2. IAEA – Radiation Protection of Patients: https://www.iaea.org
3. Radiopaedia: https://radiopaedia.org
4. Image Wisely: https://www.imagewisely.org

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MIT /GE/OE/150: Human Physiology in Medical Radiology

Course Type: TH; Generic/Open Elective
Total Credits: 02 **Total Contact Hours**: 30 Hrs.
Maximum Marks: 50

Learning Objectives of the Course

The course aims to provide:

1. Understanding of basic human physiology relevant to medical radiology
2. Concepts on normal physiological functions of major body systems
3. Fundamental ideas on physiological processes with imaging procedures
4. Conceptual development of basic practical skills in physiological measurements
5. Practice concepts of safe and effective radiological practice

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Course Outcomes (COs)

After completion of this course, students should be able to:

1. **CO1:** Explain normal physiology of major human body systems
2. **CO2:** Perform basic physiological measurements and observations
3. **CO3:** Identify organs and systems using charts, models, and images
4. **CO4:** Correlate physiological functions with radiological investigations
5. **CO5:** Apply physiological knowledge during imaging procedures

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Unit No.	Course Content	Contact Hours
Unit 1	**General Principles, Cell, Tissues & Body Systems** 1.1 Introduction to physiology, homeostasis, and feedback mechanisms 1.2 Cell structure and function 1.3 Tissues: epithelial, connective, muscular, nervous	10 Hrs.

Unit No.	Course Content	Contact Hours
	1.4 Overview of cardiovascular system: heart, blood vessels, blood composition, cardiac cycle, pulse, BP 1.5 Overview of respiratory system: mechanism of breathing, gas exchange, lung volumes, oxygen and CO_2 transport	
Unit 2	**Nervous, Digestive, Urinary & Endocrine Systems** 2.1 Nervous system: CNS, PNS, reflexes, sensory pathways, autonomic system 2.2 Digestive system: GI tract anatomy, digestion, liver, pancreas, gallbladder functions 2.3 Urinary system: kidneys, ureters, bladder, urine formation, renal function 2.4 Endocrine system: major glands, hormones, mechanism of action, metabolic regulation	10 Hrs.
Unit 3	**Reproductive, Musculoskeletal & Special Senses** 3.1 Reproductive system: male/female anatomy, menstrual cycle, pregnancy 3.2 Musculoskeletal system: bones, joints, muscles, movement and contraction 3.3 Special senses: eye (vision), ear (hearing and balance) 3.4 Relevance of each system to medical imaging: X-ray, CT, MRI, ultrasound, contrast studies	10 Hrs.

Text Books

1. Guyton A.C. & Hall J.E., *Textbook of Medical Physiology*, Elsevier
2. Tortora G.J. & Derr ickson B.H., *Principles of Anatomy and Physiology*, Wiley

Reference Books

1. Ganong W.F., *Review of Medical Physiology*, McGraw-Hill
2. Chaurasia B.D., *Human Anatomy & Physiology*, CBS Publishers
3. Sembulingam K. & Sembulingam P., *Essentials of Medical Physiology*, Jaypee

Online References

1. MedlinePlus (NIH): https://medlineplus.gov
2. NCBI Bookshelf: https://www.ncbi.nlm.nih.gov/books
3. Radiopaedia (Clinical Correlation): https://radiopaedia.org
4. Khan Academy – Physiology: https://www.khanacademy.org

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MIT /VSC/T/150: OBS in X Ray Department

Course Type: Observership; Vocational Skill Course
Total Credits: 02 **Total Contact Hours: 30 Hrs.**
Maximum Marks: 50

Learning Objectives of the Course

This course help learners to

1. Understand the **day-to-day functioning** of an X-ray department
2. Identify and operate **radiographic equipment and accessories** safely
3. Apply **exposure and geometric factors** to obtain diagnostically acceptable images
4. Evaluate radiographic images and recognize **artifacts and errors**
5. Practice **radiation protection** for patients, staff, and self
6. Gain hands-on exposure to **CR, DR, and digital image processing**
7. Follow **ethical, legal, and documentation standards** in radiography

Course Outcomes (COs)

CO1: Describe radiology department workflow, safety rules, and professional responsibilities
CO2: Identify X-ray equipment and explain principles of X-ray production and image formation
CO3: Apply exposure and geometric factors to optimize radiographic image quality
CO4: Perform patient positioning and assist in routine and special radiographic procedures
CO5: Operate CR and DR systems and evaluate images using exposure indices
CO6: Apply digital image processing techniques and utilize PACS/RIS systems

At least 15 experiments have to be performed

- Orientation to radiology department workflow and safety rules
- Identification of X-ray equipment, tube, control panel, table, and accessories
- Study of principles of X-ray production and radiographic image formation
- Effect of exposure factors (kVp, mA, time, mAs) on image quality
- Effect of geometric factors (SID, OID, focal spot) on image quality
- Evaluation of image quality parameters: density, contrast, resolution, and noise
- Patient positioning and routine radiographic projections
- Computed Radiography (CR) and Digital Radiography (DR) workflow
- Exposure index, image evaluation, and common radiographic artifacts
- Radiation protection practices for patients and radiology staff
- Special radiographic procedures (portable X-ray and trauma imaging)
- Paediatric and geriatric radiography considerations
- Use of grids, filtration, collimation, and dose optimization techniques
- Digital image processing: windowing, levelling, and post-processing
- PACS, RIS, and DICOM usage, image storage, documentation, QA, BMW

MIT /VSC/T/151: OBS in Mammography

Course Type: Observership; Vocational Skill Course
Total Credits: 02 **Total Contact Hours: 30 Hrs.**
Maximum Marks: 50

Learning Objectives of the Course

This will help learners to

1. Understand the role of mammography in early detection and screening step of breast cancer.
2. Identify indications and contraindications for mammography
   Describe the basic principles of mammographic imaging, including X-ray production and image formation

Course Outcomes (COs)

After completion of this course students will able to

CO1.Identify and describe mammography equipment, imaging techniques, and standard views (CC and MLO).

CO2. Demonstrate understanding of patient preparation, positioning (CC & MLO & Special View) and breast compression techniques through observation.

CO3.Recognize common normal and abnormal mammographic findings, including masses, calcifications, and architectural distortion

At least 10 experiments have to be performed

1. Department Layout (Machine Details and Practical Information)
2. Patient Privacy
3. Patient Scheduling
4. Mammography X ray unit
5. Compression device
6. Radiation Shielding
7. Dose Optimization
8. Patient history taking
9. Patient explanation
10. Procedure explanation
11. CC view positioning
12. MLO view positioning
13. Breast compression
14. Exposure parameters
15. Infection control and ethics

Note: No reference books and Text books are required. This is hospital Observership.