DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,

CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A+' Grade

CIRCULAR NO.SU/ Science & Technology/ Diploma /03/2026.

It is hereby inform to all concerned that, Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology **Academic Council at it's meeting held on 16 March, 2026 has been accepted as per National Education Policy-2020" the following syllabi under the Faculty of Science & Technology run at the University Department, Dr. Babasaheb Ambedkar Marathwada University as appended herewith.**

Sr.No	Subject Name	Semester
1.	***Diploma in Medical Imaging Technology (DMIT)***	**III & IV**
2.	***Diploma in Medical Laboratory Technology (DMLT)***	**III & IV**

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.U/Sci & Tech/Diploma./2025-26/160-62
Date: 03/ 06/ 2026

Deputy Registrar,
Syllabus Section

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**

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 – 431 004 (MS), India
Deen Dayal Upadhyay KAUSHAL Kendra (DDUKK)

Dr.Bharti W. Gawali
M.Sc., Ph.D., SET in Computer Science
Director

"NAAC Reaccredited with 'A+' Grade"

Phone No : +91-240-3266 (30)/2403386
Fax No : +91-240-2403113
Cell : +91-9404012032,
Email : director.ddukk@bamu.ac.in

Ref No: DDUKK/2025-26/ 429 **Date: 03/06/2026**

To,
The Deputy Registrar,
Syllabus Section,
Dr. Babasaheb Ambedkar Marathwada University,
Chh. Sambhajinagar (MS) – 431004

SUB: Submission of syllabi of the subjects of 1) DMLT (2nd year) & 2) DMIT (2nd year) for approval purpose.

Dear Sir,

With reference to above ciated subject, it is hereby submitted that syllabi of the subjects of **1) DMLT (2nd year - 3rd & 4th sem) & 2) DMIT (2nd year – (3rd & 4th sem)** of **ESDC of** Deen Dayal Upadhyay KAUSHAL Kendra (DDUKK) for approval have been submitted to the syllabus section.

Hence it is now requested to kindly approve the syllabi and do the needful.

I am looking forward to have your esteemed co-operation.

Thanking you with utter anticipation,

Best Regards,

Director
Deen Dayal Upadhyay KAUSHAL Kendra (DDUKK)

Director
Deen Dayal Upadhyay Kaushal Kendra,
Dr. Babasaheb Ambedkar
Marathwada University,
Chhatrapati Sambhajinagar(MS)-431004

Encl. – as above

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR

Two Year Diploma

Medical Imaging Technology

(DMIT)

IIIrd and IVth Semester

As per National Education Policy-2020

From the Academic Year 2026-27 & Onwards.

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Marathwada University,
Chhatrapati Sambhajinagar(MS)-431004

Syllabus of Semester III of

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

DMIT 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		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		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		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 Equipments	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	-------				2	2
							22

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MAJOR-MANDATORY COURSES

MIT /DSC/T/200: Radiographic Technique in Routine Procedure

Course Type: TH; Major | Total Contact Hours: 30 Hrs.

Total Credits: 02 | Maximum Marks : 50

Learning Objectives of the Course

The course aims to:

1. Impart knowledge of the basic principles, concepts, and technologies underlying radiographic imaging.
2. Train students in accurate patient positioning and the effective use of radiographic techniques for routine clinical procedures.
3. Equip students with the skills required for image acquisition, quality assessment, and evaluation in diagnostic radiography.

Course Outcomes (COs)

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

1. Explain basic principles of radiography and imaging technology
2. Perform routine radiographic positioning for chest, skeletal, and abdominal examinations
3. Apply appropriate exposure factors and positioning techniques

Unit No.	Course Content	Contact Hours
I	**Fundamentals and Chest Radiography** 1. Basic principles of radiography and imaging technologies 2. Patient positioning, immobilization, and radiation protection 3. Radiographic anatomy and image evaluation 4. Thorax and upper airways a. Chest (PA, AP, lateral views) b. Ribs and sternum 5. Soft tissue neck	10 Hrs.
II	**Musculoskeletal Radiography** 1. Shoulder joint and clavicle 2. Upper extremities: a. Humerus, elbow, forearm, wrist, hand, fingers 3. Lower extremities: a. Femur, knee, leg, ankle, foot, toes	10 Hrs.

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	4. Hip, pelvis, and sacro-iliac joints 5. Vertebral column: cervical, thoracic, lumbar, sacrum, coccyx	
III	**Skull, Abdomen and Special Radiography** 1. Abdomen and pelvic cavity (plain radiography) 2. Skull radiography 3. Facial bones and paranasal sinuses 4. Dental radiography (intraoral and extra oral views) 5. Ward and mobile radiography 6. Basic trauma and emergency radiographic procedures	10 Hrs.

MIT /DSC/P/226: Radiographic Technique in Routine Procedure Lab

Course Type: LAB; Major **Total Contact Hours: 60 Hrs.**

Total Credits: 02 **Maximum Marks : 50**

Learning Objectives of the Course:

The course aims to:

1. Familiarize students with the operation of X-ray equipment, radiographic room protocols, and radiation safety practices.
2. Develop basic skills in patient positioning, communication, and immobilization techniques required for routine radiographic examinations.
3. Provide practical knowledge of common radiographic procedures and imaging of various anatomical regions using standard projections.

Course Outcomes (COs):

Upon successful completion of the course, students will be able to:

1. Demonstrate knowledge of X-ray room setup, equipment handling, patient care, and radiation protection measures.
2. Perform basic patient positioning and identify appropriate radiographic projections for routine examinations of the chest, extremities, spine, skull, and abdomen.
3. Assist in routine radiographic procedures, including mobile radiography, and recognize normal anatomical structures on common radiographs.

At least Six experiments have to be performed

1. Orientation to X-ray room, equipment & radiation safety
2. Basic patient positioning, immobilization & communication
3. Chest radiography – PA, AP & lateral views

4. Upper airway & soft tissue neck radiography
5. Shoulder joint & clavicle radiography
6. Upper extremity radiography (hand to humerus)
7. Lower extremity radiography (foot to femur)
8. Hip, pelvis & sacro-iliac joint radiography
9. Vertebral column radiography (C-, T-, L-spine)
10. Abdomen & pelvic cavity radiography
11. Skull radiography
12. Facial bones & paranasal sinus radiography
13. Dental radiography (basic intra-oral views)
14. Ward & mobile radiography procedures

Text Books

1. Whitley AS, Jefferson G, Holmes K, Hoadley G, Sloane C, Anderson C. Clark's Positioning in Radiography. 13th ed. CRC Press; 2015
2. Rollins JH, Curtis T. Merrill's Atlas of Radiographic Positioning and Procedures. 16th ed. Elsevier; 2024

Reference Books

1. Bontrager KL, Lampignano JP. Textbook of Radiographic Positioning and Related Anatomy. 10th ed. Elsevier; 2023.
2. Eisenberg RL. Clinical Imaging: An Atlas of Differential Diagnosis. 7th ed. Lippincott Williams & Wilkins; 2022.
3. Rollins JH, Curtis TDT. Merrill's Atlas of Radiographic Positioning and Procedures. 16th ed. Elsevier; 2024.

Online References

1. Radiopaedia (Radiographic Anatomy & Techniques): https://radiopaedia.org
2. Image Wisely (Radiation Safety): https://www.imagewisely.org
3. IAEA – Diagnostic Radiology: https://www.iaea.org
4. Medscape Radiology: https://emedicine.medscape.com

MIT /DSC/T/201: Radiographic Techniques for Special Procedures

Course Type: TH; Major **Total Contact Hours: 30 Hrs.**

Total Credits: 02 **Maximum Marks : 50**

Learning Objectives of the Course

The course aims to:

1. Develop an understanding of the principles, techniques, and clinical indications of special radiographic procedures.
2. Equip students with the knowledge and skills required for patient preparation and

the safe, appropriate use of contrast media in specialized imaging studies.

3. Promote the application of radiation protection principles and effective patient care practices during special radiographic procedures.

Course Outcomes (COs)

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

1. Explain the principles, techniques, and clinical indications of various special radiographic procedures used in diagnostic imaging.
2. Demonstrate appropriate patient preparation and the safe handling and administration of contrast media for special radiographic examinations.
3. Apply radiation protection principles and patient care practices to ensure safety, quality, and ethical conduct during special radiographic procedures.

Unit No.	Course Content	Contact Hours
I	**Contrast Studies of Gastrointestinal & Genitourinary Systems** 1. Gastrointestinal tract contrast studies: a. Barium swallow b. Barium meal c. Barium follow-through d. Barium enema 2. Salivary gland studies (Sialography) 3. Biliary system imaging (oral and IV cholangiography) 4. Urinary system radiography: a. KUB b. Intravenous pyelography (IVP) c. Retrograde urethrogram (RGU) and Micturating cystourethrogram (MCU) 5. Female reproductive system radiography: Hysterosalpingography (HSG)	**10 Hrs.**
II	**Breast, Respiratory & Advanced Radiographic Techniques** 1. Mammography: principles, positioning, and indications 2. Respiratory system special procedures 3. Tomography: principles and applications 4. Macro-radiography: technique and uses 5. Soft tissue radiography	**10 Hrs.**
III	**Localization, Interventional & Special Applications** 1. Localization of foreign bodies 2. Interventional radiography: a. Principles and equipment b. Role of radiographer	**10 Hrs.**

	c. Radiation protection and patient care 3. Basic sterile techniques and contrast media precautions	

MIT /DSC/P/227: Radiographic Techniques for Special Procedures Lab

Course Type: LAB; Major **Total Contact Hours: 60 Hrs.**

Total Credits: 02 **Maximum Marks : 50**

Learning Objectives of the Course:

The course aims to:

1. Impart knowledge of the principles and diagnostic applications of special radiographic investigations.
2. Equip students with the skills required for patient preparation and appropriate administration of contrast media in special imaging procedures.
3. Promote adherence to radiation safety standards and the delivery of quality patient care throughout specialized radiographic examinations.

Course Outcomes (COs):

Upon successful completion of the course, students will be able to:

1. Explain the principles, indications, and workflow of common special radiographic procedures and contrast studies.
2. Demonstrate knowledge of patient preparation, contrast media handling
3. Demonstrate positioning techniques used in procedures such as barium studies, IVP, RGU, MCU, and mammography.

At least Six experiments have to be performed

1. Orientation to special procedure room, equipment & safety
2. Preparation of patient & contrast media for special studies
3. Barium swallow procedure – positioning & technique
4. Barium meal & follow-through procedures
5. Barium enema procedure
6. Salivary gland study (Sialography) – demonstration
7. Biliary system studies – cholangiography (demo)
8. KUB & intravenous pyelography (IVP)
9. RGU & MCU procedures
10. Hysterosalpingography (HSG) – demonstration
11. Mammography – positioning & basic techniques
12. Respiratory system special radiographic procedures
13. Tomography & macro-radiography – demonstration
14. Soft tissue radiography
15. Localization of foreign bodies

16. Localization of foreign bodies Interventional radiography – equipment & workflow (demo)

Text Books

1. Rollins JH, Curtis TDT. Merrill's Atlas of Radiographic Positioning and Procedures. 16th ed. Elsevier; 2024.
2. Whitley AS, Jefferson G, Holmes K, Hoadley G, Sloane C, Anderson C. Clark's Positioning in Radiography. 14th ed. CRC Press; 2020.

Reference Books

1. Bontrager KL, Lampignano JP. Textbook of Radiographic Positioning and Related Anatomy. 10th ed. Elsevier; 2023.
2. Bushong SC. Radiologic Science for Technologists: Physics, Biology, and Protection. 12th ed. Elsevier; 2021.
3. Eisenberg RL. Clinical Imaging: An Atlas of Differential Diagnosis. 7th ed. Lippincott Williams & Wilkins; 2022.

Online References

1. Radiopaedia: https://radiopaedia.org
2. IAEA – Diagnostic Radiology: https://www.iaea.org
3. Image Wisely: https://www.imagewisely.org
4. Medscape Radiology: https://emedicine.medscape.com

MINOR COURSES

MIT /MN/T/200: Pathology Lab – I

Course Type: TH; Minor | **Total Contact Hours: 30 Hrs.**

Total Credits: 02 | **Maximum Marks : 50**

Learning Objectives of the Course

The course aims to:

1. Develop an understanding of the basic concepts and modalities employed in pathology laboratories.
2. Familiarize students with the role of laboratory investigations in disease diagnosis, prognosis, and patient management.

Course Outcomes (COs)

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

1. Explain the basic concepts of pathology laboratory modalities and their role in disease diagnosis and patient care.
2. Identify different branches of pathology
3. Demonstrate knowledge of specimen collection, labelling, transportation, and storage procedures.

Unit No.	Course Content	Contact Hours
I	**Introduction of Modalities of Pathology Laboratory** 1. Hematology 2. Biochemistry 3. Clinical pathology 4. Parasitology 5. Histopathology and Cytology 6. Microbiology 7. Blood Banking	10 Hrs.
II	**Introduction of Pathology Laboratory** 1. Importance of pathology laboratory in healthcare 2. Types of laboratories 3. Standardized Clinical Lab Set up 4. Laboratory first Aid Kit and Measures 5. Responsibility of Laboratory worker and Laboratory Safety	10 Hrs.
III	**Basics of Laboratory Procedures**	10 Hrs.

	1. Types of sample collection methods 2. Handling and labelling of specimens 3. Use of PPE (gloves, mask, apron) 4. Biomedical waste disposal Universal precautions	

Text Books

1. Sharma BK. An Introduction to Medical Laboratory Technology. 12th ed. CBS Publishers & Distributors; 2020.
2. Ochei J, Kolhatkar A. Medical Laboratory Science: Theory and Practice. 2nd ed. Tata McGraw-Hill; 2000.
3. McPherson RA, Pincus MR, editors. Henry's Clinical Diagnosis and Management by Laboratory Methods. 24th ed. Elsevier; 2021.

Reference Books

1. Harr RR. *Clinical Laboratory Science Review*. 5th ed. F.A. Davis; 2014.
2. Ochei J, Kolhatkar A. Medical Laboratory Science: Theory and Practice. 2nd ed. Tata McGraw-Hill; 2000.

Online References

1. **https://medlineplus.gov/lab-tests/?utm_**
2. **https://www.ascp.org/?utm_**

MIT /MN/T/201: Pathology Lab - II

Course Type: TH; Minor | **Total Contact Hours: 30 Hrs.**

Total Credits: 02 | **Maximum Marks : 50**

Learning Objectives of the Course

The course aims to:

1. Provide a comprehensive understanding of phlebotomy and its significance in diagnostic and laboratory services.
2. Develop knowledge and skills in the proper collection, handling, and transportation of various clinical specimens.

Course Outcomes (COs)

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

1. Demonstrate knowledge of the principles, techniques, and safety protocols involved in phlebotomy and blood specimen collection

2. Collect, label, preserve, transport, and handle various clinical specimens accurately to maintain specimen integrity and ensure reliable diagnostic results

Unit No.	Course Content	Contact Hours
I	**Introduction to Phlebotomy** 1. Definition and scope of phlebotomy 2. Role of a phlebotomist in radiology departments 3. Importance in diagnostic procedures 4. Ethics and patient communication 5. Common veins used for venipuncture: a. Median cubital vein b. Cephalic vein c. Basilic vein	10 Hrs.
II	**Venipuncture Procedure** 1. Patient Preparation a. Patient identification b. Consent and explanation of procedure c. Positioning of patient d. Managing anxious or pediatric patients e. Fasting and non-fasting samples **2.** Standard Steps a. Hand hygiene b. Verify patient details c. Select vein d. Apply tourniquet e. Clean puncture site f. Insert needle g. Collect blood h. Remove needle safely i. Apply pressure and bandage j. Label specimen correctly	10 Hrs.
III	1. Specimen Collection & Handling a. Labelling procedures b. Transport and storage of samples c. Prevention of haemolysis 2. Complications & Emergency Management a. Hematoma	10 Hrs.

	b. Syncope (fainting) c. Excessive bleeding d. Infection e. Difficult venous access f. Needle-stick accidents 3. Special Procedures in Radiology a. IV cannulation basics b. Contrast media preparation support c. Blood urea and creatinine sample collection before contrast studies d. Care during CT/MRI contrast procedures	

Text Books

1. Pathology for the Health Professions,by Ivan Damjanov et al. 6th Edition, 2021
2. Phlebotomy Essentials – (7th Ed, 2021)

Reference Books

1. Basic Pathology: Introduction to Mechanisms of Disease,BY Sunil R. Lakhani et al., 4th Edition, 2009
2. Phlebotomy Handbook: Blood Specimen Collection, Diana Garza, Kathleen Becan-McBride, 10th Edition, 2020

Generic / Open Elective

MIT /GE/OE/T/200: Human Biochemistry in Medical Radiology – Part 1

Course Type: TH; GE/OE | **Total Contact Hours: 30 Hrs.**

Total Credits: 02 | **Maximum Marks : 50**

Learning Objectives of the Course

The course aims to:

1. Develop an understanding of the fundamental biochemical principles underlying normal human body functions.
2. Provide knowledge of the metabolism of carbohydrates, lipids, and proteins and their significance in maintaining physiological processes.
3. Familiarize students with common biochemical investigations and their relevance to diagnostic imaging and radiological practice.

Course Outcomes (COs)

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

1. Explain basic biochemical concepts and biomolecules
2. Describe metabolism and its clinical relevance
3. Interpret basic biochemical investigations

Unit No.	Course Content	Contact Hours
I	**Basic Biochemistry and Biomolecules** a. Introduction to biochemistry and its relevance to medical radiology b. Structure and function of carbohydrates c. Structure and function of lipids d. Structure and function of proteins e. Enzymes: classification, mechanism of action, factors affecting enzyme activity f. Vitamins: fat-soluble and water-soluble vitamins (functions and deficiency)	**10 Hrs.**
II	**Metabolism and Clinical Biochemistry** a. Carbohydrate metabolism: glycolysis, glycogenesis, glycogenolysis (overview)	**10 Hrs.**

	b. Lipid metabolism: fatty acid oxidation and synthesis (overview) c. Protein metabolism: amino acids, transamination, deamination d. Clinical importance of blood glucose, lipid profile, and protein levels e. Liver function tests (LFT) f. Renal function tests (RFT)	
III	**Body Fluids, Electrolytes and Biochemical Applications in Radiology** a. Body fluids: composition and functions b. Acid–base balance and pH regulation c. Electrolytes: sodium, potassium, calcium, chloride – functions and imbalance d. Plasma proteins and their clinical significance e. Biochemical basis of contrast media reactions f. Role of biochemistry in disease diagnosis and imaging correlation	**10 Hrs.**

Text Books

1. Satya Narayana U, Chakrapani U. *Biochemistry*. 6th ed. Elsevier; 2022.
2. Murray RK, Bender DA, Botham KM, Kennelly PJ, Rodwell VW, Weil PA. Harper's Illustrated Biochemistry. 32nd ed. McGraw-Hill Education; 2021.

Reference Books

1. Vasudeva DM. Textbook of Biochemistry for Medical Students. 10th ed. Jaypee Brothers Medical Publishers; 2023.
2. Devlin TM. Textbook of Biochemistry with Clinical Correlations. 7th ed. Wiley-Liss; 2010.

Online References

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

Skill Enhancement Courses

MIT /VSC/T/200: X ray Contrast Media	
Course Type: TH; VSC	**Total Contact Hours: 30 Hrs.**
Total Credits: 02	**Maximum Marks : 50**

Learning Objectives of the Course

The course aims to:

1. Develop an understanding of the fundamental principles of X-ray imaging and the processes involved in image formation.
2. Provide knowledge of the role, properties, and clinical importance of contrast media in diagnostic imaging procedures.
3. Familiarize students with the various clinical applications of contrast media and their use in enhancing diagnostic accuracy.

Course Outcomes (COs)

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

1. Explain the fundamentals of X-ray imaging and the importance of contrast media.
2. Describe the various diagnostic procedures involving contrast media such as angiography, CT, and urography.
3. Classify and compare different types of contrast media, including ionic and non-ionic agents.

Unit No.	Course Content	Contact Hours
I	**Basics of X-ray Imaging and Contrast Media** 1. Introduction 2. Production of X-ray Images 3. Necessity of Contrast Media 4. Use of Contrast Media (Overview)Enzymes: classification,	**10 Hrs.**
II	**Applications of Contrast Media** 1. Angiography a. Arteriography b. Venography c. Digital Subtraction Angiography 2.Intravenous Urography 3. Intravenous Pyelography 4. CT (Computed Tomography) 5. Myelography	**10 Hrs.**

	6. Interventional Techniques	
III	**Types, Safety, and Clinical Considerations** 1. Types of Contrast Media 2. Ionic and Non-Ionic Media 3. Safety of Contrast Media 4. Choice of Contrast Media 5. Reactions of Contrast Media	10 Hrs.

Text Books

1. Whitley AS, Jefferson G, Holmes K, Hoadley G, Sloane C, Anderson C. Clark's Positioning in Radiography. 14th ed. CRC Press; 2020.
2. Bontrager KL, Lampignano JP. Textbook of Radiographic Positioning and Related Anatomy. 10th ed. Elsevier; 2023.
3. Thayalan K. Basic Radiological Physics. 2nd ed. Jaypee Brothers Medical Publishers; 2014.

Reference Books

1. Bushberg JT, Seibert JA, Leidholdt EM Jr, Boone JM. The Essential Physics of Medical Imaging. 4th ed. Wolters Kluwer; 2020.
2. ACR Manual on Contrast Media. Version 2024. American College of Radiology; 2024.
3. Herring W. Learning Radiology: Recogning the Basics. 4th ed. Elsevier; 2019.

Online References

1. Radiopaedia – Comprehensive resource for radiology concepts and imaging cases
2. American College of Radiology (ACR) – Guidelines on contrast media and safety
3. World Health Organization (WHO) – Safety standards and healthcare guidelines
4. National Center for Biotechnology Information (NCBI) – Research articles and clinical studies

MIT /VSC/T/201: Physics of Radiological Equipments

Course Type: TH; VSC **Total Contact Hours: 30 Hrs.**

Total Credits: 02 **Maximum Marks : 50**

Learning Objectives of the Course

The course aims:

1. To develop an understanding of the fundamental principles and concepts underlying advanced radiological imaging techniques, including Computed Tomography (CT) and Magnetic Resonance Imaging (MRI).
2. To familiarize students with the components, functions, and operational principles of modern CT and MRI imaging systems.
3. To provide knowledge of the image acquisition and formation processes involved in CT and MRI for accurate diagnostic imaging.

Course Outcomes (COs)

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

1. Explain the basic physics and principles of CT, Ultrasonography, and MRI.
2. Describe the structure and functioning of radiological equipment.
3. Understand image formation and quality factors in different modalities.

Unit No.	Course Content	Contact Hours
I	**Computed Tomography (CT)** a. Introduction & basic principle b. Components of CT scanner c. Image formation & Hounsfield Units d. Spiral/Multislice CT (basic concept) e. Image quality & artifacts (basic) f. Radiation dose & safety g. Clinical applications	**10 Hrs.**
II	**Ultrasonography (USG)** 1. Angiography a.Arteriography b. Venography c. Digital Subtraction Angiography	**10 Hrs.**

	2. Intravenous Urography 3. Intravenous Pyelography 4. CT (Computed Tomography) 5. Myelography 6. Interventional Techniques	
III	**Magnetic Resonance Imaging (MRI)** a. Introduction & basic principle (NMR) b. Components of MRI system c. T1 & T2 relaxation (basic) d. Image formation (simple concept) e. Artifacts (basic) f. Safety (magnetic hazards) g. Clinical applications	**10 Hrs.**

Text Books

1. Thayalan K. Basic Radiological Physics. 2nd ed. Jaypee Brothers Medical Publishers; 2014.
2. Johns HE, Cunningham JR. The Physics of Radiology. 4th ed. Charles C Thomas; 1983.
3. Chavhan GB. MRI Made Easy (For Beginners). 2nd ed. Jaypee Brothers Medical Publishers; 2011.

Reference Books

1. Bushberg JT, Seibert JA, Leidholdt EM Jr, Boone JM. The Essential Physics of Medical Imaging. 4th ed. Wolters Kluwer; 2020.
2. Miele FR. Ultrasound Physics and Instrumentation. 5th ed. Pegasus Lectures; 2021.
3. Seeram E. Computed Tomography: Principles, Design, Artifacts, and Recent Advances. 4th ed. Elsevier; 2024.

Online References

1. Radiopaedia – Imaging concepts and case studies
2. American College of Radiology (ACR) – Guidelines and safety standards
3. World Health Organization (WHO) – Health and safety resources

Diploma in Medical Imaging Technology – Semester IV

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits	CA		UA	
			Theory	Practical	Theory	Practical		MIN	MAX	MIN	MAX
Internship	MIT/Internship/326	Hospital Internship	At least 660 Hours in Hospital				22	96	240	144	360

Director
Deen Dayal Upadhyay Kaushal Kendra,
Dr. Babasaheb Ambedkar
Marathwada University,
Chhatrapati Sambhajinagar(MS)-431004

Syllabus for Semester – IV

Diploma in Medical Imaging Technology

DMIT/Internship/326: Hospital Internship

Total Credits : 22 **Total Contact Hours : 660 Hrs**

Maximum Marks : 600

Learning Objectives of the Course:

The course aims to:

1. Provide students with exposure to real hospital environments, radiology department workflow, and professional healthcare practices.
2. Enable students to develop practical skills in routine radiographic procedures, patient positioning, radiation safety, and imaging techniques.
3. Provide opportunities to observe and assist in advanced imaging modalities such as CT, MRI, Ultrasound, Mammography, and special radiographic procedures.
4. Develop professional communication, teamwork, documentation, ethics, and patient-care skills in clinical environments.
5. Enable students to understand hospital protocols, equipment handling, infection control, and quality assurance practices in medical imaging departments.

Course Outcomes (COs) :

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

1. Demonstrate professional behavior and clinical work practices followed in radiology and diagnostic imaging departments.
2. Perform routine radiographic procedures and assist in advanced imaging investigations under supervision.
3. Apply radiation protection principles, patient safety measures, and infection control practices during imaging procedures.
4. Maintain technical records, imaging documentation, and internship reports effectively.
5. Communicate professionally with radiologists, technologists, patients, and healthcare staff in clinical settings.

Module No.	Course Content	Contact Hours
I	**Clinical Internship Guidelines** The Clinical Internship is a core experiential learning component designed to bridge the gap between academic learning and clinical practice. To successfully complete this course, students must adhere to the following procedural guidelines: **1. Planning and Commencement** **• Detailed Training Plan** Within one week of joining the host hospital or diagnostic center, the student must submit a detailed training plan to the Department Advisor. This plan should outline	**660 Hrs**

Director
Deen Dayal Upadhyay Kaushal Kendra,
Dr. Babasaheb Ambedkar
Marathwada University,
Chhatrapati Sambhajinagar(MS)-431004

the student's learning objectives, clinical duties assigned by the hospital, areas of training, and the proposed timeline for completion.

• Daily / Weekly Diary

Students are required to maintain a formal clinical diary documenting daily and weekly activities, procedures observed or performed, challenges encountered, and skills acquired during the internship. The diary must be signed by the Clinical Supervisor / Radiology Mentor and submitted to the Department Advisor on a weekly basis.

2. Documentation Requirements

• Progress Reports

The student shall prepare two interim progress reports (at 30 days and 60 days) documenting clinical exposure, departmental rotations, technical skills acquired, and completion of assigned activities.

• Final Write-up

At the conclusion of the internship, the student shall prepare a concise summary evaluating the achievement of the learning objectives and clinical competencies outlined in the initial training plan.

• Internship Report

The student must submit a comprehensive final internship report (approximately 50 pages). The report should include:

- Hospital / Diagnostic Center profile
- Description of departmental postings
- Clinical procedures observed or assisted
- Technical skills acquired
- Radiation safety practices followed
- Case observations
- Professional learning outcomes
- Conclusion on the clinical and professional impact of the internship

Students must maintain a minimum of 80% attendance during the clinical internship period.

Students shall maintain patient confidentiality, professional ethics, and appropriate conduct during clinical postings.

Evaluation and Marking Scheme

The total assessment for the OJT/Internship is **600 Marks**, divided into **40% Continuous Internal Assessment (CIA)** and **60% University Assessment (UA)**.

I. Continuous Internal Assessment (CIA) – 240 Marks (40%)

The CIA is conducted by the department in two phases to track the student's progress.

Phase	Timeline	Particulars	Marks	Sub-Total
CIA (I)	30 Days	Clinical Internship Plan & Goal Setting	40	80 Marks
		First 30 Days Clinical Activity Report & Presentation	40	
CIA (II)	60 Days	Second 60 Days Clinical Activity Report	40	160 Marks
		Progress Report & Presentation	40	
		Comprehensive Viva-Voce	80	
Total CIA				240 Marks

II. University Assessment (UA) – 360 Marks (60%)

The University Assessment (UA) is a summative evaluation conducted jointly by one Internal Examiner and one External Examiner from a recognized hospital, diagnostic center, or other university.

1. General Professional Assessment (75 Marks)

Assessment of the student's professional conduct and clinical behavior during hospital training:

- **Punctuality:** Attendance, promptness, discipline, and commitment to assigned clinical hours.
- **Sincerity:** Dedication towards patient care, imaging procedures, and assigned responsibilities.
- **Initiative:** Willingness to learn, proactive participation in clinical activities, and problem-solving approach.
- **Commitment:** Understanding clinical duties, departmental workflow, and professional responsibilities.
- **Professional Attitude:** Ethical conduct, grooming, communication etiquette, patient interaction, and receptiveness to feedback.

2. Skills & Technical Competency (90 Marks)

Assessment of practical knowledge and technical competencies acquired during clinical internship:

- **Communication:** Professional verbal and written communication with patients, radiologists, technologists, and healthcare staff.

- **Documentation:** Maintenance of logbooks, patient records, case documentation, and internship reports.
- **Reporting:** Timely submission of progress reports and communication of assigned clinical work.
- **Technical Competency:** Demonstration of skills in patient positioning, equipment handling, radiation safety, imaging assistance, and departmental procedures.
- **Goal Achievement:** Attainment of clinical learning objectives and program-specific competencies.

3. Formal Deliverables (195 Marks)

• Written Internship Report (120 Marks)

Evaluation of the comprehensive internship report (approximately 50 pages) including:

- Hospital profile
- Departmental postings
- Clinical procedures observed/performed
- Technical skills acquired
- Radiation protection practices
- Case studies and observations
- Professional learning outcomes

• Presentation & Viva-Voce (75 Marks)

Final presentation and viva-voce examination conducted before the evaluation panel to assess:

- Clinical understanding
- Technical knowledge
- Communication skills
- Case presentation abilities
- Overall internship experience and learning outcomes

Passing requires a minimum of 40% in both CIA and UA separately.

Clinical Areas for Training

Students shall undergo rotational training in:

- X-Ray Department
- CT Scan
- MRI
- Mammography
- Special Radiography
- Dark Room / Digital Imaging

- Radiation Safety Unit
- PACS/RIS Section

Proposed Training Partner Collaborations

1. Criticare Asia Multispecialty Hospital and Research Centre – Kurla, Mumbai.
2. Criticare Asia Multispecialty Hospital and Research Centre – Andheri West (Juhu), Mumbai.
3. Criticare Asia Multispecialty Hospital and Research Centre – Andheri East, Mumbai.
4. Criticare Asia Multispecialty Hospital and Research Centre – Malad west, Mumbai.
5. Tapadia Diagnostic Centre – Ch. Sambhajinagar.
6. Lambodar Hospital - Ch. Sambhajinagar.
7. Sharma Pathology - Ch. Sambhajinagar.
8. Samarth Pathology - Ch. Sambhajinagar.
9. Jindani Pathology - Ch. Sambhajinagar.
10. Dr. Patho Lab - Ch. Sambhajinagar.
11. Sahara Hospital - Ch. Sambhajinagar.
12. Care United Ciigma Hospitals - Ch. Sambhajinagar.
13. Diagnopein diagnostic center – Pune
14. Orchid Specialty Hospital – Pune
15. Oster & pearl Multispecialty Hospital – Pune