

**BACHELOR OF VOCATION
MEDICAL TECHNOLOGY (MT)
COURSE STRUCTURE AND SYLLABUS: W.E. F 2020-21 Admitted batch
III year –5thSemester**

Course No.	Course Name	Mid semester	Semester final	Total marks	Teaching Hours/ Week	Credits
1	Chemistry paper-1	25	75	100	4	4
2	Chemistry paper-1 lab	0	50	50	2	1
3	Chemistry paper-2	25	75	100	4	4
4	Chemistry paper-2 lab	0	50	50	2	1
5	Techniques in MRI	25	75	100	4	4
6	Practical: Techniques in MRI	0	50	50	2	1
7	Basic & Advanced MRI	25	75	100	4	4
8	PRACTICAL: Basic & Advanced MRI	0	50	50	2	1
9	Interventional Procedures and Angiography	25	75	100	4	4
10	PRACTICAL: Interventional Procedures and Angiography	0	50	50	2	1
11	Care Of Patients In Diagnostic Radiology	25	75	100	4	4
12	OJT	0	50	50	2	1
	TOTAL			900	36	30

*** As per CBCS-2021 syllabus

1. Aims and objectives of UG program in Subject:

- To develop Ability to ensure that medical equipment is well maintained and safely functional.
- To Follow safety codes and standards, troubleshoot faulty devices and achieve appropriate skills for employment.
- To enhance the Ability to Operate & Assist technicians while operating X- Ray, CT & Ultra Sound, M.R.I equipment

2. Learning outcomes of Subject (in consonance with the Bloom's Taxonomy):

A. Program Outcomes (POs):

The Learning Outcomes of the program could be in consonance with the various Imaging Techniques, which includes remember (Lower order)

1. Understand(Lower Order)
 2. Apply(Lower Order)
 3. Analyze(Higher Order)
 4. Evaluate& Problem Solving(Higher Order)
 5. Create new Technologies(Higher Order)
- **Critical thinking:** Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems and making decisions during various emergencies situations and machinery problems.
 - **Effective communication:** Able to formally communicate Scientific ideas and practical diagnosis of various emergency cases to others using both oral and written communication skills.
 - **Social interaction:** Able to develop individual behaviour and influence society and social structure.
 - **Effective citizenship:** Able to work with a sense of responsibility towards social awareness and follow the ethical standards in the society.
 - **Ethics:** Ability to demonstrate and discuss ethical conduct in scientific activities.
 - **Self-directed and life-long learning:** Able to recognize the need of life-long learning and engage in research and self-education.

3.GENERAL CURRICULAR ACTIVITIES

A. Lecturer-based:

- 1. Class-room activities:** Organization of Group discussions, question-answer sessions, scientific observations, use of audio-visual aids, guidance programmes, examination and evaluation work (scheduled and surprise tests), quizzes, preparation of question banks, student study material, material for PG entrance examinations etc.
- 2. Library activities:** Reading books and magazines taking notes from prescribed and reference books and preparation of notes on lessons as per the syllabus; Reading journals and periodicals pertaining to different subjects of study; Making files of news- paper cuttingsetc.
- 3. Lab activities:** Organization of practical's, maintenance of lab attendance registers/log registers, maintenance of glassware and chemicals
- 4. Activities in the Seminars, workshops and conferences:** Organization of at least one seminar/workshop/conference per academic year either on academic/research aspects and inculcate research spirit among the students
- 5. Research activities:** Student study projects (General / RBPT model), Minor or Major research projects, Research guidance to research scholars, Publication of research articles/papers (at least one in 2 years) in UGC-recognized journals, Registration in Vidwan /Orcid /Scopus/Web of Science
- 6. Smart Classroom Activities:** Organization of Departmental What'sApp groups, Ed Modo groups/Google Class Rooms/Adobe Spark groups for quick delivery of the subject; Preparation of Moocs content & presentation tube lessons by trained lecturers; Using smart/digital/e- class rooms (mandatory) wherever present; Utilization of YouTube videos (subject to copyrights)etc.

Student-Based:

- 1) **Class-room activities:** Power point presentations, Seminars, Assignments
 - 2) **Library activities:** Visit to library during library hour and preparation of notes
 - 3) **Lab activities:** Maintenance of observation note book and record, keeping lab clean and tidy
 - 4) **Activities in the Seminars, workshops and conferences:**
Participation/presentation in Seminar/workshop/conference
- 4. Recommended Skill enhancement courses:** (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-labwork.

5. Recommended Co-curricular activities :(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. The aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to MEDICAL domain are listed below:

➤ **Academic-based**

- Preparation of Charts/Clay or Thermocol Models
- Debates, Essay Writing Competitions
- Group Discussions
- Departmental magazine
- Formation of Book clubs
- Viva-Voce

➤ **Lab/Research-based**

- Digital dissections
- Field Visit/Visiting hospitals and primary health centers and submission of report
- Training at research centers (Hospitals, Diagnostic centers,)
- Exposure to scientific instruments and hands-on experience

➤ **Value-based**

- Organization of first-aid camp, swachha bharat, cleanliness week, girl-child importance, Nutrition and health awareness etc.

World Cancer Day (February 4 th)	World Tobacco day (May 31 st)
National Science Day (Feb 28 th)	World Polio day (October 24 th)
National Doctors day(march 30 th)	World Health day(April 7 th)
World Heart day(29 th September)	World Kidney day(2 nd Thursday in march)
World Diabetes day(14 th November)	World Liver day(19 th April)

B) General

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Group Discussions on:
- Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
- Any similar activities with imaginative thinking.

6. Recommended Continuous Assessment methods:

75 Marks semester End Examinations and 25 Marks CIA

Required instruments/software/ computers for the course (Lab/Practical course- wise required i.e., for a batch of 15 students)

S. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1.	Techniques in MRI	MRI MACHINE	GE	1
2.	Basic & Advanced MRI	MRI MACHINE	GE	1
3.	Interventional Procedures and Angiography	FLUROSCOPY	GE	1
		CATHLAB	GE	1
		CT MACHINE	PHILIPS	1
		ULTRASONOGRAPHY	PHILIPS	1

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-3 VOCATION COMPONENT	Techniques in MRI	Hrs/Wk: 4

I. Aim and objectives of Course: Techniques in MRI

At the end of this year, student should be able to:

1. To detect bone and joint problems, like complex bone fractures and tumors
2. To identify disease or injury within various regions of the body
3. Describe the construction and operation of MRI scanner
4. Describe various controls available in the MRI unit and trade-offs between various image quality parameters.
5. Image optimization and making diagnosis to help the Radiologist

II. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

Unit-1 Protocols:

Protocols in MRI for Whole Body:

Brain,Orbits,Sella,Ear,Neck,Tongue,Abdomen,Pelvis,Shoulder,Humerus,Elbow,Wrist
Hand, Radius Ulna, Femur , Knee F, Foot Ankle

Unit-2 Advanced MRI Techniques:

MR Angiography, (TOF Phase Contrast and Dynamic Contrast MR Angiography)

UNIT-3 IMAGING TECHNIQUES I:

Functional MRI, MR Spectroscopy: Basic Principles, Localization Techniques In MRS,
Metabolites Of MRS Clinical Uses of MRS, CSF Flow Study

UNIT-4 IMAGING TECHNIQUES II:

Recent Advancement In MRI And Open MRI,
MRCP: Principles, Sequences Used In MRCP Protocol and Technique, Clinical Applications of
MRCP

UNIT-5 IMAGING TECHNIQUES III:

Diffusion Weighted Imaging, Susceptibility weighted imaging, Perfusion: Principles, Clinical
Applications, Techniques, Perfusion in Brain Tumors, Arterial spin labeling

REFERENCES:

1. MRI in Practice by Catherine Westbrook
2. MRI Physics for Radiologist by Alfred Horowitz
3. MRI made easy (for beginner) - Govind B. Chavhan
4. Diagnostic Radiology – recent advances and applied physics in imaging AIIMS, MAMC
– PG I Imaging series

3. Details of Lab/Practical/Experiments/Tutorials syllabus:

PRACTICALS:

1. Basic MRI techniques
2. Contrast Procedures and Positioning Radiography.
3. MRA
4. MRS
5. Tractography

4. MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-3 VOCATION COMPONENT	Techniques in MRI	Hrs/Wk: 4

I. Answer any Five of the following questions

5x5=25M

1. Explain DWI.
2. Explain MRA.
3. Explain Shoulder Protocol.
4. Explain Brain Protocol.
5. Explain Pelvis Protocol.
6. Explain Knee Protocol.
7. Explain Abdomen Protocol.
8. Explain Wrist Protocol.

II. Answer the following questions

5X10=50M

9. a. Explain in detail about SWI.

(Or)

- b. Explain about Orbit protocol.

10. a. Explain Ankle protocol.

(Or)

- b. Explain Elbow Protocol.

11. a. Explain MRS.

(Or)

- b. Explain Whole Spine Protocol.

12. a. Explain Leg Protocol.

(Or)

- b. Explain MRCP?

13. a. Explain Cardiac MRI.

Or

- b. Explain Functional MRI .

5. PRACTICAL (LAB) MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 1
PAPER-3 VOCATION COMPONENT	Techniques in MRI	Hrs/Wk: 2

1. Clinical applications on MRI?
2. Techniques on MRI
3. Recent Advances in MRI

Allotment of marks to be followed for evaluation of the practical

1. Record-----	10Marks
2. Day to day activity-	20Marks
3. Procedure/Execution /Result	15 Marks
4. Viva-----	05 Marks
TOTAL	50 Marks

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-4 VOCATION COMPONENT	Basic & Advanced MRI	Hrs/Wk: 4

1. Aim and objectives of Course:

1. Describe the construction and operation of MRI scanner
2. Describe various controls available in the MRI unit and trade-offs between various image quality parameters.

2. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

Unit-1 MRI Imaging - Principle:

Basic principle and concepts of MRI, the need for MRI, Role of hydrogen in MR Imaging, Advantages and disadvantages of MRI, MR Contrast media.

Unit-2 Instrumentation:

MR architecture, Magnet system and gradient system, patient screening before scanning.

Unit-3

Safety aspects, types of magnets and RF coils, Basic types of pulse sequence and advanced pulse sequences

Unit-4 Image Formation:

Fourier transformation, K space imaging, Image formation in MRI

Unit-5:

Gating mechanism in MRI. MR artifacts , factors influencing image quality

References:

1. MRI in Practice by Catherine Westbrook
2. MRI Physics for Radiologist by Alfred Horowitz
3. MRI made easy (for beginner) - Govind B. Chavhan
4. Diagnostic Radiology – recent advances and applied physics in imaging AIIMS, MAMC – PG I Imaging series

3. Details of Lab/Practical/Experiments/Tutorials syllabus:

1. MRI 1,5 TESLA PHILLIPS MACHINE OPERATION OBSERVATION
2. Types of magnets and RF coils
3. MRI artifacts
4. Recent Advances In CT imaging
5. MRI image formation

4. MODEL QUESTIONPAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-4 VOCATION COMPONENT	Basic & Advanced MRI	Hrs/Wk: 4

I. Answer any Five of the following questions

5x5=25M

1. Explain Basic principle MRI.
2. Explain Contrast Media.
3. Explain of Role of hydrogen in MR Imaging.
4. Explain Gradient System.
5. Explain Fourier transformation.
6. Explain FLAIR.
7. Explain RF Coils.
8. Explain MRI artifact.

II. Answer the following questions

5X10=50M

9. a. Explain PD.
(Or)
b. Explain MRI Image Reconstruction.
10. a. Explain Gating Mechanism.
(Or)
b. Explain Image formation in MRI.
11. a. Explain T1.
(Or)
b. Explain STIR.
12. a. Explain k space.
(Or)
b. Explain patient screening before scanning.
13. a. Explain Post Processing Techniques.
(Or)
b. Explain T2.

5.PRACTICAL (LAB) MODEL QUESTIONPAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 1
PAPER-4 VOCATION COMPONENT	Basic & Advanced MRI	Hrs/Wk: 2

1. Write patient preparation, contraindication and parameters for MRI Imaging ?
2. Basic principle MRI?
3. Explain about MRI image formation?

Allotment of marks to be followed for evaluation of the practical

1. Record-----	10Marks
2. Day to day activity-	20Marks
3. Procedure/Execution /Result	15 Marks
4. Viva-----	05 Marks
TOTAL	50 Marks

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-5 VOCATION COMPONENT	INTERVENTIONAL PROCEDURES AND ANGIOGRAPHY	Hrs/Wk: 4

1. Aim and objectives of Course: Interventional Procedures And Angiography

1. To detect bone and joint problems, like complex bone fractures and tumors
2. To identify disease or injury within various regions of the body

2. Detailed Syllabus: (Five units with each unit having 12 hours of Class work)

Patient preparation, Imaging techniques and protocols for various parts of body

Unit-1: Principle & Instrumentation:

Digital Subtraction Angiography: Instrumentation, Principle of Digital Subtraction Angiography, Various Digital Subtraction Techniques II TUBE

Unit-2: Basics of Invasive Radiology:

Procedure of image guided biopsies and drainage procedure.

Invasive Angiography & Venography 4 Vessel DSA, Aortogram, Selective Angiogram, Venogram

Unit-3: Invasive Monitoring: Cardiac resuscitation measures, Management of shock.

Interventional Procedures & Angiography Stenting, PTA + stenting, stent graft, Embolisation.

Unit-4: Neuro Interventional Procedures: Embolisation, GDC, Glue embolisation, Vertebroplasty

Unit-5: Adult & Pediatric Invasive Cardiology: Basics of cardiac catheterization Coronary angiogram

References:

1. Christensen's Physics of Diagnostic Radiology – 4th edition, Thomas S. Curry, 1990.
2. Applied Angiography for Radiographers, Laudicina & Wean, W.B. Saunders Company, 1994.
3. The Requisites: Vascular & Interventional Radiology, John A. Kaufman, Michael J. Lee, Mosby, 2004.

3. Details of Lab/Practical/Experiments/Tutorials syllabus:

1. Interventional procedures techniques
2. Knowledge about PTA
3. Knowledge about DSA
4. Knowledge about Embolization

4. MODEL (THEORY) QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-5 VOCATION COMPONENT	INTERVENTIONAL PROCEDURES AND ANGIOGRAPHY	Hrs/Wk: 4

I. Answer any Five of the following questions

5x5=25M

1. Explain about GLUE Embolization .
2. Explain about Management of shock.
3. Explain the types of shock.
4. .Explain the production of x rays.
5. Explain contrast media.
6. Explain Vertebroplasty.
7. Explain Cardiac catheterization.
8. Explain biological effects of radiation.

II. Answer the following questions

5X10=50M

9. a. Explain DSA.
Or
b. Explain Stenting .
10. a. Explain Venogram.
Or
b. Explain II TUBE
11. a. Explain Contrast reactions .
Or
b.Explain Embolization .
12. a. Explain Fluoroscopy.
Or
b. Explain GDC.
- 13.a. Explain any two techniques of DSA.
Or
b. Explain patient preparation for various contrast procedures.

5. PRACTICAL (LAB) MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 1
PAPER-5 VOCATION COMPONENT	INTERVENTIONAL PROCEDURES AND ANGIOGRAPHY	Hrs/Wk: 2

1. Explain II TUBE.
2. Venogram.
3. Cardiac catheterization.

Allotment of marks to be followed for evaluation of the practical

1. Record	10Marks
2. Day to day activity-	20Marks
3. Procedure/Execution /Result	15 Marks
4. Viva-	05 Marks
TOTAL	50 Marks

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Credits: 4
PAPER-6 VOCATION COMPONENT	Care Of Patients In Diagnostic Radiology	Hrs/Wk: 4

1. Aim and objectives of Course: Care of Patients In Diagnostic Radiology

1. To care the patient and safe handling of patient.
2. To care First aid in radiology department and sterilization and isolation techniques

2. Detailed Syllabus: (Three units with each unit having 12 hours of class work)

Unit - 01: Introduction to Patient Care:

Clinical Responsibility, Legal Responsibility, Hospital and the Radiographer.

General Patient Care:

A. Patient Transfer Technique

B. Turning the Patient (Patient Conditions, Mechanic Safety).

C. Restraint Techniques - Trauma, Paediatric, Geriatric, Physically Handicapped , Emotionally Disturbed Patients, Anaesthetised Patient, Moving Chair And Stretcher Patients.

D. Specific Patient Conditions-Tubes and Catheters, Nasogastric, Chest, Urinary, Intravenous, Oxygen and Other. (Cast Surgical and Cardiac) Alcoholic, Bed Pans and Urinals.

E. Security of Patient Properties-Out Patient, Inpatient.

F. General Comfort and Reassurance For The Patient

Unit -02:

I. Practical Nursing Procedures in Radiology:

Temperature, Pulse, Respiration, B.P., Laying Up A Sterile Trolley, Assisting At An Iv Injection, A Simple Sterile Dressing, O2 Therapy And Resuscitation, Giving A Patient Bed Pan, Giving an Enema, the Catheterized Patient, the Use of A Sucker.

II. Preparation of the Patient:

General Abdominal Preparation, Clothing of the Patient.

Unit -03:

I. Sterilization and sterile techniques:

Methods of Sterilization, Central Sterile Supply, Preparation of the Hands For Aseptic Procedures.

II. Drugs in the X-Ray department:

Poisons and Dangerous Drugs, Units of Measurement, Drugs Used In Preparation Of The Patient, Contrast Agents Used In X Ray Examinations, Drugs Used In Resuscitation, Labeling and Issuing.

Unit -04:

Infection Control:

A. Infections Pathogens, Communicable Disease Nasocomial Infection, Other

B. Isolation Technique: Category, Purpose, Procedure.

C. Infection Sources: Bacteria Virus, Other.

D. Transmission Modes: Aerobic, Contact, Other.

E. Procedures: Institutional, Departmental

F. Physiological Considerations:

G. The Infection Patient in the X Ray Department. The Infections Patient In The Ward.

Unit-05:

I. Patient's Care during Investigation:

G.I. Tract, Renal Tract, Biliary Tract, Respiratory Tract, Gynecology, Cardiovascular, Lymphatic System, C N S.

II. First Aid In The X Ray Department:

Radiological Emergencies, Shock, Hemorrhage, Burns, Scalds, Cpr, Loss Of Consciousness, Asphyxia, Fractures, Electricshock.

III. Medico-Legal Aspects Of The Radiographers Work:

Breach Of Professional Confidence, Negligence, Procedure In The Event Of Accident, The Importance Of Records.

IV. The Patient And The Radiation Hazards:

The Nature Of The Risk, Significant Examinations And Protective Measures.

References:

1. Care Of Patients In Diagnostic Radiography – Chesney And Chesney
2. Guidelines On Patient Care In Radiography – C.Gunn&C.S.Jackson.
3. Hospital Infection Control For Nurses – Peter Meers

3. THEORY MODEL QUESTION PAPER

BVOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Max. Marks: 75
PAPER- 6	Care Of Patients In Diagnostic Radiology	3 Hrs

I. Answer any Four of the following questions

5x5=25M

1. Explain Central Sterile Supply.
2. Explain Preparation of the Patient.
3. Explain about Temperature, Pulse and Respiration.
4. Explain the Patient and the Radiation Hazards.
5. Explain O₂ Therapy and Resuscitation, Giving A Patient Bed Pan.
6. Explain Patient's care during Investigation Respiratory Tract, Gynecology, Cardiovascular, Lymphatic System, C N S.
7. Explain giving An Enema.
8. Explain protective measures for patient care.

I. Answer the following questions

5X10=50M

- 9 a. Explain Medico-Legal Aspects of the Radiographers Work.
(Or)
b. Explain The Infection Patient in the X Ray Department and in the Ward .
- 10 a. Explain Restraint Techniques.
(Or)
b. Write in detail about Isolation Technique.
11. a. Explain First Aid in the X -Ray Department.
(Or)
b. Write about Drugs used in preparation of the Patient.
12. a. Explain Respiratory Tract?
(Or)
b. Explain Lymphatic System?
13. a. Explain Procedure In The Event of Accident.
(Or)
b. Explain Significant Examinations of patient care.

4. PRACTICAL (LAB) MODEL QUESTION PAPER

BVOC MT	MT MEDICAL TECHNOLOGY (Semester: V)	Max. Marks: 50
PAPER- 6	OJT :Care Of Patients In Diagnostic Radiology	3 Hrs

Allotment of marks to be followed for evaluation of the practical

1. Record	10Marks
2. Day to day activity-	20Marks
3. Procedure/Execution /Result	15 Marks
4. Viva-	05 Marks
TOTAL	50 Marks

LIST OF PAPER SETTERS FOR VOCATIONAL COURSES
MEDICAL TECHNOLOGY (MT)

S.No	Name of the Examiner	College	Service
1	Dr. K. Sambasiva Rao	Rangaraya medical College, Kakinada	10 yrs
2	Dr. B. Anu Radha	Rangaraya medical College, Kakinada	20 yrs
3	Dr. B. Sowbhagya Lakshmi	Rangaraya medical College, Kakinada	20yrs
4	Dr. M. Santhi Sree	Rangaraya medical College, Kakinada	8 yrs
5	Dr. K. Vindhya	Rangaraya medical College, Kakinada	9 yrs
6	Ms. G. Mohini Latha	PVR TRUST college, Kakinada	1 yrs