

**MRSPTU M.SC. (RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2021 ONWARDS (2 YEARS COURSE)**

Total Credits = 24

SEMESTER 1st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MRMIS1-101	Advance Techniques and Instrumentation of MRI	3	1	0	40	60	100	4
MRMIS1-102	Interventional Radiology Techniques	3	1	0	40	60	100	4
MRMIS1-103	Care of patient in diagnostic Radiology	3	1	0	40	60	100	4
MRMIS1-104	Quality control and radiation safety	3	1	0	40	60	100	4
MRMIS1-105	Nuclear medicine imaging techniques	3	1	0	40	60	100	4
MRMIS1-106	Advance Techniques and Instrumentation of MRI - Practical	0	0	4	60	40	100	2
MRMIS1-107	Interventional Radiology Techniques - Practical	0	0	4	60	40	100	2
	Total	-	-	-	320	380	700	24

Total Credits = 24

SEMESTER 2nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MRMIS1-201	Physics relevant to radiology	3	1	0	40	60	100	4
MRMIS1-202	Basic logic gates	3	1	0	40	60	100	4
MRMIS1-203	Duties and Organisation of Radiology Department	3	1	0	40	60	100	4
MRMIS1-204	Basic Electronics of Radiology	3	1	0	40	60	100	4
MRMIS1-205	Medical illegal issues in Diagnostic Radiology	3	1	0	40	60	100	4
MRMIS1-206	Physics Relevant to Radiology- Practical	0	0	4	60	40	100	2
MRMIS1-207	Basic Electronics of Radiology - Practical	0	0	4	60	40	100	2
	Total	-	-	-	320	380	700	24

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SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MRMIS1-301	Radiation Biology	3	1	0	40	60	100	4
MRMIS1-302	Principles of radiation protection	3	1	0	40	60	100	4
MRMIS1-303	Advance Techniques and Instrumentation of Ultrasonography	3	1	0	40	60	100	4
MRMIS1-304	X-ray Production	3	1	0	40	60	100	4
MRMIS1-305	Computed Instrumentation	3	1	0	40	60	100	4
MRMIS1-306	Principles of radiation protection- Practical	0	0	4	60	40	100	2
MRMIS1-307	X-ray production - Practical	0	0	4	60	40	100	2
	Total	-	-	-	320	380	700	24

Total Credits = 15

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
MRMIS1-401	Thesis and Internship	0	0	30	180	120	300	15
	Total	-	-	-	180	120	300	15

Overall Marks / Credits

Semester	Marks	Credits
1st	700	24
2nd	700	24
3rd	700	24
4th	300	15
Total	2400	87

ADVANCE TECHNIQUES AND INSTRUMENTATION OF MRI

Subject Code:MRMIS1-101

L T P C
3 1 0 4

Duration: (60 Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and advanced techniques and instrumentations of magnetic resonance imaging (MRI)

Course Outcomes:

- Demonstrate knowledge of advanced technique of MRI, its related instrumentation, 2-D & 3D image formation and safety aspects of MRI.

Unit-1.

12 Hrs

- Principles of Advance Techniques of MRI, Principles of Instrumentation of MRI, Relaxation time in MRI, T1 weighted image, T2 weighted image, Proton density image

Unit-2.

12 Hrs

- Types of magnets, RF Transmitter, Receiver coils, Gradient coils, Shim coils, RF shielding computers, Spin Echo sequence, Turbo spin echo pulse spin, Gradient echo sequence, Turbo gradient echo pulse sequence, inversion recovery sequence

Unit-3.

12 Hrs

- STIR sequence, SPIR sequence, FLAIR sequence, Echo planner imaging and fast imaging sequences, Advance pulse sequences

Unit-4.

12 Hrs

- Image formation, 2D Fourier Transformation method, K space representation, 3D Fourier imaging, MIP, MR contrast media

Unit-5.

12 Hrs

- MR angiography, TOF and PCA MR Spectroscopy, Protocols in MRI for whole body, MRI artifacts, Safety aspects in MRI, Cardiac MRI, Abdominal imaging protocols

Recommended Text Books / Reference Books:

- Dance, D. R., Christofides, S., Maidment, A. D. A., McLean, I. D., & Ng, K. H. (2014). Diagnostic radiology physics: A handbook for teachers and students. Endorsed by: American Association of Physicists in Medicine, Asia-Oceania Federation of Organizations for Medical Physics, European Federation of Organisations for Medical Physics
- Ffytche, D. H., & Guy, C. (2005). Introduction to the Principles of Medical Imaging.

INTERVENTIONAL RADIOLOGY TECHNIQUES

Subject Code:MRMIS1-102

L T P C
3 1 0 4

Duration: (60 Hrs)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge of interventional techniques for radiotherapy

Course Outcomes:

- Demonstrate knowledge of interventional radiology techniques, imaging of diseased organs, various imaging techniques and handling of radioactive materials and radiation unit.

Unit-1.

12 Hrs

Introduction, Need for interventional procedures, Informed consent, DSA, Basic principles of interventional radiology techniques, Types of interventional radiology techniques, Equipments, Single and bi-plane angiographic equipment, Recording system.

Unit-2.

12 Hrs

Patient care, Preparation for procedure, Post-procedure care, Roll of radiographer, Crash trolleys, Emergency drugs, Catheters, ECG pressure injector, Needles, 3D rational angiography.

Unit-3.

12 Hrs

Procedure, Diagnostic and therapeutic interventional procedure, PTC, PTBD, Stenting neprostromy, uretic stenting guide wire drainage of collections/ abcess, angiogram, angioplasty, immobilization, radiofrequency in nerve blocks.

Unit-4.

12 Hrs

Thyroid imaging, GIT system, Cardiovascular system, Iodine 131 therapy for thyrotoxicosis, Thyroid ablation, PET imaging, SPECT imaging. Types of noise, quality assurance of imaging equipments, variation in image precipitation, Technologist and technical parameters, Area monitor.

Unit-5.

12 Hrs

Radiation safety nuclear medicine, Radiation units, Quantities of radiation, Handling of radioactive materials, storage of radioactive materials, disposable of radioactive wastes, radiation monitoring, survey meters, wipe testing, contamination monitor, isotope calibrator.

Recommended Text Books / Reference Books:

- Dance, D. R., Christofides, S., Maidment, A. D. A., McLean, I. D., & Ng, K. H. (2014). Diagnostic radiology physics: A handbook for teachers and students.
- Edward E.. Christensen, Curry, T. S., & James E.. Dowdey. (1978). *An introduction to the physics of diagnostic radiology*. Lea & Febiger.

CARE OF PATIENT IN DIAGNOSTIC RADIOLOGY

Subject Code: MRMIS1-103

L T P C
3 1 0 4

Duration: (60 Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge of Precautionary measures to be taken for a patient during radiological treatment

Course Outcomes:

- Demonstrate knowledge of precautions needed to handle patients in radiology unit.

Unit-1.

15 Hrs

Introduction- Patient care, Responsibilities of radiologist, Patient transfer technique, Restraint technique, I.V. Injection administration.

Unit-2.

15 Hrs

Nursing procedure in radiology, Abdominal preparation, Clothing of patient, care of an anaemic patient, handling emergencies in radiology, first-aid in the X-ray department, patient care during investigation.

Unit-3.

15 Hrs

Care of investigation of following system: G.I.T. tract, Billiary tract, respiratory tract, gynaecology, cardiovascular, lymphatic system, C.N.S., urinary system, cranial system, reproductive system.

Unit-4.

5 Hrs

Infection control, Isolation techniques, Infection sources, Transmission modes, Psychological considerations, Sterilization and sterile techniques.

Unit-5.

10 Hrs

Patient education, communication, explanation, examination, radiation, safety protection, informed consents, interaction with patient, behaviour of technologist, preparation of X-ray room, lightening of X-ray room, care of X-ray machine and equipments.

Recommended Text Books / Reference Books:

- Dance, D. R., Christofides, S., Maidment, A. D. A., McLean, I. D., & Ng, K. H. (2014). Diagnostic radiology physics: A handbook for teachers and students.

QUALITY CONTROL AND RADIATION SAFETY

Subject Code: MRMIS1-104

**L T P C
3 1 0 4**

Duration: (60 Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge to maintain the quality and protection of radiotherapy

Course Outcomes:

- Demonstrate knowledge of quality control aspects including installation, operation and maintenance of equipments related to diagnosis and imaging.

Unit-1.

10 Hrs

Objectives of Quality Control: Improve the quality of imaging, diagnostic values, radiation exposure, Reduction of film wastage, maintenance of various diagnostic and imaging units

Unit-2.

10 Hrs

Quality Assurance activities: Equipment installation, Equipment selection, Operational phase; Preventive maintenance, Purchase, specification, Acceptance, Routine testings, X ray generator and tube, Image receptors, Radiographic equipment; Fluoroscopic equipment; Mammographic equipment, Conventional tomography; Computed tomography

Unit-3.

10 Hrs

General principles and preventive maintenance for X-ray, storage of film and chemicals, Light beam alignment; X-ray out-put and beam quality, machine calibration

Unit-4.

10 Hrs

Film processing: manual and automatic, Faults tracing; Accuracy of imaging, image distortion for digital imaging devices, LASER printer calibration, Film latitude; Film contrast; Film speed Resolution, Artifacts of films and image recording

Unit-5.

10 Hrs

Maintenance and care of equipment: Routine cleaning of equipment and instruments, Maintenance of automatic processor and manual processing units, Record keeping and log book maintenance, special care of mobile equipment.

Unit-6.

10 Hrs

Modern Radiological and Imaging Equipments, Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and PACS related. Image artifacts their different types, causes and remedies, Basic Computed Tomography, Advanced computed tomography, Advanced technique & instrumentation of MRI

Recommended Text Books / Reference Books:

- Dance, D. R., Christofides, S., Maidment, A. D. A., McLean, I. D., & Ng, K. H. (2014). Diagnostic radiology physics: A handbook for teachers and students

NUCLEAR MEDICINE IMAGING TECHNIQUES

Subject Code: MRMIS1-105

L T P C
3 1 0 4

Duration: (60 Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge to know about the concepts of nuclear medicine.

Course Outcomes:

- Demonstrate knowledge of basic principles of nuclear physics, radiation detector, and nuclear medicine.

Unit-1.

15 Hrs

Basic attempt and nuclear physics, Principle of nuclear physics, Structure and composition of atom, Composition of radioactivity, specific activity, modes of radioactive decay, structure of nucleus, quantities and units of atom.

Unit-2.

15 Hrs

Radiation detectors, Principle of radiation detector, Ionization chambers, Gas-filler detectors, Scintillation detectors, Proportional counters, Semiconductor detectors, Geiger-muller conductors.

Unit-3.

15 Hrs

Production of radionuclides, Principle of radionuclides, Radionuclide generators, Accelerator produced radionuclides, Production of radionuclides.

Unit-4.

5 Hrs

Instrumentation, Basic principle of anger camera, Detector system, Electronics collimators, Image display system, Recording system, Scanning camera.

Unit-5.

10 Hrs

Radio pharmacy, Radio pharmaceuticals, General principle of tracer technique, Preparation of cold kit, Compound of technetium-99mm Radiation safety in nuclear medicine, radiation units, radiation quantities, handling of radioactive materials, storage of radioactive materials, spells of radioactive materials, disposable radioactive waste, radiation monitoring.

Recommended Text Books / Reference Books:

- Dance, D. R., Christofides, S., Maidment, A. D. A., McLean, I. D., & Ng, K. H. (2014). Diagnostic radiology physics: A handbook for teachers and students

ADVANCE TECHNIQUES AND INSTRUMENTATION OF MRI PRACTICAL

Subject Code:MRMIS1-106

L T P C
0 0 4 2

Duration: 4Hrs/week

Course Objectives:

- Students will be able to learn about the **Advance Techniques and Instrumentation of MRI Lab.**

Course Outcomes:

- Demonstrate knowledge of basic working principles of various instruments of MRI Lab.

Practical

1. Advance Techniques of MRI.
2. RF Transmitters and Receiver coils.
3. Turbo gradient echo pulse sequence
4. Advance pulse sequences
5. 2D Fourier Transformation method
6. 3D Fourier imaging
7. MR contrast media and angiography
8. Protocols in MRI and angiography

INTERVENTIONAL RADIOLOGY TECHNIQUES PRACTICAL

Subject Code:MRMIS1-107

L T P C
0 0 4 2

Duration: 4Hrs/week

Course Objectives:

- Students will be able to learn about various interventional radiology techniques.

Course Outcomes:

- Demonstrate knowledge of basic working principles behind various interventional radiology techniques

Practical

1. Introduction and procedure for radiology techniques
2. Equipments and Recording system in radiology
3. Patient care and Preparation for radiology procedure
4. Crash trolleys and Emergency drugs for radiology
5. Catheters, ECG pressure injector, Needles
6. Radiation safety nuclear medicine