Syllabus and Curriculum
of
Diploma in M.R.I. Technician course

(To be implemented From 2016 – 17 session)

Uttar Pradesh State Medical Faculty, Lucknow.

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OBJECTIVES OF THE COURSE

To prepare a **M.R.I. technician** who –

- Can perform MRI Scans of all parts precisely.
- Is able to develope film.
- Can administer contrast & is able to handle adverse reactions to it.
- Is well aware of Radiation Hazards & protection measures.
- Can read basics of various MRI Scan plates.

Outline of Curriculum of Diploma in M.R.I. Technician course

FIRST YEAR

THEORY (Classes: 9 AM to 12 Noon)

First paper : **Syllabus covers** -
1. General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body) and **detailed study of skull ,brain and spinal cord.** 2. Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing MRI Scan.

Second paper : **Syllabus covers** -
1. Details of radiological Anatomy & surface making. 2. Basic physics, Electricity, Magnetism, Physics of MRI. 3. Hand hygiene & prevention of cross infection. 4. Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).

FIRST YEAR

PRACTICAL (Classes: 1 PM to 4 PM)

Practical classes will be after lunch; from 1 PM to 4 PM.

Students must present in the hospital/MRI Scan unit for practicals.

During first year, they should be there only as "Observers" in practical classes.

Following subjects must be taught; though there will not be any exam from these-
1. Basic Computer skills. 2. Basic English. 2. **Soft skills like -** Interpersonal relationship skills & moral education. .

Outline of Curriculum
of
Diploma in M.R.I. Technician course

SECOND YEAR

THEORY (claases:9 AM to 12 Noon)

First paper : **Syllabus covers -**
1. Details of Only relevant surgical & medical conditions. 2. Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.

Second paper : **Syllabus covers -**
1. MRI physics, MRI positioning, Various MRI techniques & Radiation Hazards. 2. MRI guided procedures. 3. Bio-medical physics of MRI Scan machine & developement of MRI film etc.

SECOND YEAR

PRACTICAL (claases:9 AM to 12 Noon)

Practical exams syllabus should cover-

Hands on training of :-

- Preparation of patient for MRI Scan.
- Performing all types of MRI Scan.
- Contrast administration & management of adverse reactions to it.
- Protection from radiation hazards.
- Assisting MRI guided procedures.
- Developing film.
- Record keeping.

ELIGIBILITY CRITERIA FOR ADMISSION & DURATION OF THE COURSE

COURSE DURATION:-

- It is 2 years, **full time** Diploma Course.

ELIGIBITY:-

- Candidate must have passed 12th with

  Physics, Chemistry, Biology

  Or

  Physics, Chemistry, Maths

  with 35% marks in Intermediate exams.

  (From UP board or any other recognised board).

- Candidate must have completed age of 17 years of age as on 31st December of admission year. There is no maximum age limit for the admission.

SCHEDULE OF EXAMINATION

FIRST YEAR

Paper	Subjects	Mark	Internal Assessment Marks	Total Marks	Pass Marks	Duration of Exam.
First Paper Theory	1.General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body) and **detailed study of skull ,brain and spinal cord.** 2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing MRI Scan.	75	25	100	50	3 Hours
Second Paper Theory	1.Details of radiological Anatomy & surface making. 2 Basic physics, Electricity, Magnetism, Physics of MRI. 3.Hand hygiene & prevention of cross infection. 4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR	75	25	100	50	3 Hours
Practical	Oral & Practical	75	25	100	50	3 Hours

SCHEDULE OF EXAMINATION

SECOND YEAR

Paper	Subjects	Mark	Internal Assessment Marks	Total Marks	Pass Marks	Duration of Exam.
First Paper Theory	1.Details of Only relevant surgical & medical conditions. 2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.	75	25	100	50	3 Hours
Second Paper Theory	1.MRI physics, MRI positioning, Various MRI techniques & Radiation Hazards. 2.MRI guided procedures. **3**. Bio-medical physics of MRI Scan machine & developement of MRI film etc. .	75	25	100	50	3 Hours
Practical	Oral & Practical	75	25	100	50	3 Hours

SCHEDULE OF COURSE

(List of holidays, Total hours, Subject wise allottement of hours)

- **List of Holidays:-**

Sundays	- 52 days
Summer vacation	- 10 days
Winter vacation	- 10 days
Gazetted holidays	- 23 days
Preparatory holidays	- 10 days
Total Holidays	- 105 days

- **Total Hours :-**

Theory classes per day	- 3 Hours
Practical classes per day	- 3 Hours
Total hours per day	- 6 Hours
Total days & hours in One year (after deduction of holidays)	- 260 days or - 1560 Hours

SCHEDULE OF COURSE

Subject wise allottement of hours

FIRST YEAR

Theory (780 Hours) Practical (780 Hours)

First Paper Theory	**1.**General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body) and **detailed study of skull ,brain and spinal cord.**	300 Hrs
	2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing MRI Scan. .	100 Hrs
Second Paper Theory	1.Details of radiological Anatomy & surface making.	100Hrs
	2.Basic physics, Electricity, Magnetism, Physics of MRI.	140 Hrs
	3.Hand hygiene & prevention of cross infection.	30 Hrs
	4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	40 Hrs
Third Paper Practical	As described in curriculum	780 Hrs
Theory: Other Subjects (These subjects must be taught; though there will not be any exam from these)	**1**.Basic Computer skills.	30 Hrs
	2.Basic English.	30 Hrs
	3.Soft skills like - Interpersonal relationship skills & moral education	10 Hrs

Subject wise allottement of hours

SECOND YEAR

Theory (780 Hours) Practical (780 Hours)

First Paper Theory	**1**.Details of Only relevant surgical & medical conditions.	350 Hrs
	2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.	20 Hrs
Second Paper Theory	1.MRI physics, MRI positioning, Various MRI techniques & Radiation Hazards.	250 Hrs
	2.MRI guided procedures.	50 Hrs
	3. Bio-medical physics of MRI Scan machine & developement of MRI film etc.	110 Hrs
Third Paper Practical	As described in curriculum	780 Hrs

Details of Curriculum for First Year Diploma in M.R.I. Technician

PAPER 1st Theory	Topics	Hours.

1.General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body) and detailed study of skull ,brain and spinal cord.	**1.** General Orientation about parts of human body. Various terms used in Anatomy. Total numbers of bones, their names & location. Basic idea about organzation of body ,from cell to organ systems.	10 Hrs
	2. Structure of Animal cell, Cell organelles & their functions	05 Hrs
	3. Human tissue, types, structure & functions.	10 Hrs
	4. Osteology: Names, location, identification and basic details of all bones. **Details of all bones of skull & various views.**	60 Hrs
	5. Joints: types, basic structure & examples.	15 Hrs
	6. Skin & appendages.	02 Hrs
	7. GIT: : Location, Gross structure, various parts & their functions.	20 Hrs
	8. Respiratory tract: Location, Gross structure, various parts & their functions.	20 Hrs
	9. Urinary tract: Gross structure, various parts & their functions. (Microscopic structure is not required.)	10 Hrs
	10. Male reproductive system: Only gross structure & functions of different parts. (Microscopic structure is not required.)	05 Hrs
	11. Female reproductive system: Only gross structure & functions of different parts. (Microscopic structure is not required.)	05 Hrs

Details of Curriculum for First Year Diploma in M.R.I. Technician

PAPER 1st Theory	Topics	Hours.

1.General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body) and detailed study of skull ,brain and spinal cord.	**12.** Endocrine system: Hormones secreted by Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal cortex, Adrenal medulla, Gonads & functions of different hormones. (Details of structure of these glands not required).	20 Hrs
	13. Details of Gross structure of brain & spinal cord. Functions of different parts of brain & spinal cord.	40 Hrs
	14. Blood: Composition & Functions. Details about Plasma, RBCs, WBCs, Platelets, Clotting system.	20 Hrs
	15. Gross structure & functions of sensory Organs - Eye, Ear, Nose, Tongue.(Details not required).	20 Hrs
	16. Basic gross structure of heart, vessels opening into heart & Leaving the heart. Arterial & Venous tree of body.	20 Hrs
	17. Lymphatic system: Structure & Functions.	05 Hrs
	18. Inumune system: Components & various mechanisms of defense.	05 Hrs

PAPER 1st Theory	Topics	Hours.
2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing MRI Scan.	1. Basic steps of Acute & chronic inflammation.	032Hrs
	2. Basics of Necrosis & apoptosis.	02 Hrs
	3. Basics of Shock.	02 Hrs
	4. Basics of Disorders of blood coagulation system.	04 Hrs
	5. Basics of Disorders of Immune system of body.	05 Hrs
	6. Modes of disease transmission & prevention of infection.	05 Hrs
	7. Sterilization & methods of sterilization used in hospitals.	10 Hrs
	8. Basic idea about types of Bacteria, Virus, Fumgi.	15 Hrs
	9. Rouths of drug administration.	02 Hrs
	10. Adverse effects & side effects of drugs.	02 Hrs
	11. Basic idea of Analgesics : Opioid & NSAIDs.	02 Hrs
	12. Basic idea of Drugs use in Cough & expectoration.	01 Hrs
	13. Basic idea of Drugs used in B.asthma & COPD.	02 Hrs
	14. Basic idea of Drugs used in GIT.	08 Hrs
	15. Basic idea of Anti Microbials.	20 Hrs
	16. Basic idea of Anti H-1 Histaminics & Corticosteroids.	02 Hrs
	17. Contrasts & drugs used in radiography.	15 Hrs

Details of Curriculum for First Year Diploma in M.R.I. Technician

PAPER 2nd Theory	Topics	Hours.

1.Details of radiological Anatomy & surface making.	1. MRI slices—Axial, coronal and sagittal sections of Brain and Spine.	20 Hrs
	2. MRI slices—Axial,coronal and sagittal sections of Orbit.	05 Hrs
	3. MRI slices—Axial,coronal and sagittal sections of PNS	05 Hrs
	4. MRI slices—Axial,coronal and sagittal sections of Neck.	10 Hrs
	5. MRI slices—Axial, coronal and sagittal sections of Thorax.	10 Hrs
	6. MRI slices—Axial, coronal and sagittal sections of Abdomen.	10 Hrs
	7. MRI slices—Axial, coronal and sagittal sections of Pelvis.	10 Hrs
	8. MRI slices—Axial, coronal and sagittal sections of Limbs.	10 Hrs
	9. MRI slices—Axial, coronal and sagittal sections of Hepatobiliary System.	10 Hrs
	10. MRI slices—Axial, coronal and sagittal sections of KUB	10 Hrs

PAPER 2nd Theory	Topics	Hours.
2.Basic physics, Electricity, Magnetism, Physics of MRI.	1. What is matter,anatomic structure,Isotopes, ions,specific gravity, temperature scales, heat, electro magnetic radiation.	10 Hrs
	2.What is electrostatics, inverse square law, types of bonds, electrical field and electrical potential, electrificion possible, conductors and insulators,electrostatics, electroscop, static discharge.	20 Hrs
	3.Basic principles of MRI, Discovery of NMR/MRI	10 Hrs
	4.General overview of MR Physics.	20 Hrs
	5.The concept of longitudinal magnetization,Larmour equation The concept of transverse magnetization,Radio frequency pulses The concept of t1 and t2 weighted images.	10 Hrs
	6.Contrast enhanced MRI & Gadolinium.	10 Hrs
	7.MR Sequences-Fast imaging sequences,Gradient fields and gradient coils,Summary of MR process,Major components of an MRI,Magnets,self test,Helium / Suprconduction & 1.5 Tesla, 3 Tesla, 8 Tesla MRI,Spin Echo, Fast Spin Echo, Inversion Recovery, Installation of MR Machine- Do' & Dont's.	50 Hrs
	8.Indications and Contraindication of MRI (Do's & Don't of MRI)----MRI SAFETY	10 Hrs

PAPER 2nd Theory	Topics	Hours.
3.Hand hygiene & prevention of cross infection.	1. Hand hygiene & method of Hand washing.	15 Hrs
	2. Prevention of cross infection.	15 Hrs

PAPER 2nd Theory	Topics	Hours.
4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	1. Code blue.	05 Hrs
	2. Details of basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	35 Hrs

Curriculum
for

	Topics
Practical	**Observership for :-**
	1. Preparation of patient for MRI Scan.
	2. Performing all types of MRI Scan.
	3. Contrast administration & management of adverse reactions to it.
	4. Protection from radiation hazards.
	5. Assisting MRI guided procedures.
	6. Developing film.
	7. Record keeping.

PAPER 1st Theory	Topics	Hours.
1.Details of Only relevant surgical & medical conditions.	1. History taking. General examination of the patient. Filling Case-sheet. Common clinical words.	15 Hrs
	2. Hypertension:- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	05 Hrs
	3. Hypotension :- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	05 Hrs
	4. Diabetes mellitus :- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	10 Hrs
	5. Diseases of blood :- Anaemia, Basics of coagulation Bleeding disorders & Haemophilia.	20 Hrs
	6. Respiratory Tract :- Pneumonia, Tuberculosis, B.asthma, COPD, Bronchiectasis, Collapse of lung, Pneumonitis, Pleural effusion, Pneumothorax, Empyema thoracis, Cancer lung.	40 Hrs
	7. Diseases of GIT & Liver & GB :-Reflux Oesophagitis, Peptic ulecrs, Gastritis, Instestinal Obstruction, Hepatitis, Cirrhosis of liver, Cholecystitis, Common mass in abdomen.	50 Hrs
	8. Diseases of Nervous system:- Stroke, Meningo-encephalitis, Glasgow coma scale, Epilepsy etc.	25 Hrs
	9. Basic idea about fractures & their general management**.**	25 Hrs
	10. **Head injury** :- SCALP injury, skull fracture, intracranial bleeds, concussion, contusion etc.	20 Hrs
	11. Out line of thoracic injury.	10 Hrs
	12. Out line of abdominal injury.	10 Hrs
	13. PIVD & other spinal diaeases.	10 Hrs
	14. Spina bifida, Meningocoele, meningo-myelocele.	10 Hrs
	15. Hydrocephalus:- Def,Causes, Types, S/S, Management.	20 Hrs
	16. Brain tumors, tuberculoma & Neurocysticercosis.	20 Hrs

1.Details of Only relevant surgical & medical conditions.	17. Diseases of Urinary tract:- Urolithiasis, Benign prostatic hyperplasia.	15 Hrs
	18. Endocrine system :- Diabetes mellitus, hypo & Hyper thyroidism.	10 Hrs
	19. Miscellaneous:- Hypo & Hyper Natraemia, Hypo & Hyper Kalaemia, Hypo & Hyper Calcaemia.	05 Hrs
	20. Infections diseases :- TB, Typhoid, Malaria, Dengue fever, Leprosy, AIDS, Amoebiasis.	10 Hrs

PAPER 1st Theory	Topics	Hours.
2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion	1. Temperature monitoring & Fever.	02 Hrs
	2. Pulse monitoring.	02 Hrs
	3. BP monitoring.	02 Hrs
	4. Respiration monitoring.	01 Hrs
	5. Types of Injection routes.	01 Hrs
	6. IM Injection.	01 Hrs
	7. IV Injection.	01Hrs
	8. SC Injection.	01 Hrs
	9. Oxygen Therapy.	03 Hrs
	10. Nebulization	03 Hrs
	11. IV Infusion (Also with infusion pump).	01 Hrs
	12. Care of Unconscious patient.	02 Hrs

PAPER 2nd Theory	Topics	Hours.
1.MRI physics, MRI positioning, Various MRI techniques & Radiation Hazards.	1.MRI SAFETY-Do's & Don't of MRI,Indications and Contraindication of MRI,Ionic and non ionic contrast,Negative and positive contrast Routes of contrast (IV, oral, rectal, vaginal),Contrast reaction and its management.	20 Hrs
	2.RADIATION-Radiation Hazards,Radiation Protection.	10 Hrs
	3.BASICS, PHYSICS AND CONCEPTS OF MR-Magnetisation Properties,Types of Magnetic characteristics of the Nucleus, Nuclear Magnetic properties of the elements.	20 Hrs
	4.Larmor Equation, Geometric Orientation,Resonance and excitation,Free induction decay: T2 Relaxation,Return of Equilibrium : T1 Relaxation,Comparison of T1 and T2,Angiography and magnetization transfer contrast,Time of flight (TOF).	30 Hrs
	5.CONCEPTS- **S**pin Echo, Fast Spin Echo, Parts of MRI Machine.	10 Hrs
	6.Artifacts, Machine dependent artifacts, Motion artifacts, Motion artifacts, Chemical shift artifacts,	10 Hrs
	7.Magnet, Resistive magnet, Superconductive magnet, Permanent Magnet	10 Hrs
	8.Safety and Bio-effects. Pulse sequences	10 Hrs
	9.Time of repetition and partial saturation- (i) T1 Weighting (ii) Spin (proton density) weighting (iii) T2 weighting (iv) Inversion recovery (v) Short tau inversion recovery (STIR) (vi) Fluid attenuated Inversion recovery (FLAIR)	20 Hrs
	10 .Gradient recall echo (GRE),Perfusion weighted MRI Diffusion weighted MRI, MR **S**pectroscopy, MR Tractography/Diffusion Tensor Imaging.	20 Hrs

PAPER 2nd Theory	Topics	Hours.
1.MRI physics, MRI positioning, Various MRI techniques & Radiation Hazards.	11. Concepts of Radiographic Positioning.	05 Hrs
	12. Scaphoid & hand.	05 Hrs
	13. Elbow & shoulder joint.	05 Hrs
	14. Foot AP & oblique.	05 Hrs
	15. Hip & Knee joint AP.	05 Hrs
	16. Pelvis AP.	05 Hrs
	17. Chest AP, PA & Lat.	05 Hrs
	18. Sub Mento vertical & PNS.	05 Hrs
	19. Skull and Towne's.	05 Hrs
	20. Abdomen Erect.	05 Hrs
	21. BARIUM Studies.	05 Hrs
	22. IVP.	05 Hrs
	23. MCU/RGU/ T tube cholangiogram/ HSG.	05 Hrs
	24. Sinogram.	05 Hrs
	25. Contrast-Media,Radiographic Contrast, Density, Detail.	05 Hrs
	26. Types of film, Cassette, Intensifying Screen.	05 Hrs
	27. Safe Light,Developer and Fixer,Manual Processing.	05 Hrs
	28.Causes of film fog, Factors of X-Ray.	05 Hrs

PAPER 2nd Theory	Topics	Hours.
2.MRI guided procedures.	**MRI PROCEDURES**	
	1. MRI Myelogram /cisternogram.	05 Hrs
	2. MRI Guided FNAC / biopsy.	05 Hrs
	3. Other Special MRI Procedures & common interventions.	30 Hrs
	4. MRI Angiography, mainly brain.	10 Hrs

PAPER 2nd Theory	Topics	Hours.
3. Bio-medical physics of MRI Scan machine & developement of MRI film etc.	1. Basic Bio-medical physics of MRI Scan machine.	80 Hrs
	2. Types of film, cassette, screen, Developer, fixer etc.	30 Hrs

for
Practical :- Second Year
Diploma in M.R.I. Technician

	Topics
Practical	**Hands on training of :-**
	1. Preparation of patient for MRI Scan.
	2. Performing all types of MRI Scan.
	3. Contrast administration & management of adverse reactions to it.
	4. Protection from radiation hazards.
	5. Assisting MRI guided procedures.
	6. Developing film.
	7. Record keeping.