PARAMEDICAL COUNCIL OF INDIA

Ch. No.157/1,Near Laxmi Nagar,Metro Station Gate No 1,Vikas Marg,Delhi-92

DIPLOMA IN CT & MRI TECHNICIAN

COURSE DURATION:-

- It is 2 years + 6 months 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.

FIRST YEAR

1) ANATOMY & PHYSIOLOGY.
2) CT & MRI TECHNIQUES
3) PHYSICS OF CT & MRI
4) PHYSICS OF CT & MRI EQUIPMENTS
5) SLICE ANATOMY & PATHOLOGY

SECOND YEAR

1) GENERAL RADIOGRAPHY (CT, USG, CONTRAST MEDIA)
2) RADIOPHYSICS, RADIOGRAPHIC POSITIONS & RADIATION HAZARDS
3) CT GUIDED PROCEDURES
4) BIO-MEDICAL PHYSICS OF CT SCAN MACHINE & DEVELOPEMENT OF CT FILM

FIRST PAPER : SYLLABUS COVERS

1.Anatomy & Physiology

1. General Orientation about parts of human body. Various terms used in Anatomy. Total numbers of bones, their names & location. Basic idea about organization of body , from cell to organ systems.

2. Structure of Animal cell, Cell organelles & their functions

DIPLOMA IN CT & MRI TECHNICIAN

3. Human tissue, types, structure & functions.

4. Osteology: Names, location, identification and basic details of all bones. Details of all bones of skull & various views.

5. Joints: types, basic structure & examples.

6. Skin & appendages.

7. GIT: : Location, Gross structure, various parts & their functions.

8. Respiratory tract: Location, Gross structure, various parts & their functions.

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.)

11. Female reproductive system: Only gross structure & functions of different parts. (Microscopic structure is not required.)

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).

13. Details of Gross structure of brain & spinal cord. Functions of different parts of brain & spinal cord.

14. Blood: Composition & Functions. Details about Plasma, RBCs, WBCs, Platelets, Clotting system.

15. Gross structure & functions of sensory Organs - Eye, Ear, Nose, Tongue.(Details not required).

16. Basic gross structure of heart, vessels opening into heart & Leaving the heart. Arterial & Venous tree of body.

17. Lymphatic system: Structure & Functions.

18. Inumune system: Components & various mechanisms of defence.

2. Physics of CT & MRI

PARAMEDICAL COUNCIL OF INDIA

Ch. No.157/1,Near Laxmi Nagar,Metro Station Gate No 1,Vikas Marg,Delhi-92

DIPLOMA IN CT & MRI TECHNICIAN

1. Basic Computed Tomography: Basic principles of CT & MRI, generations of CT & MRI, CT instrumentation, image formation in CT & MRI, CT & MRI image reconstruction, Hounsfield unit, CT & MRI image quality, CT & MRI image display.

2. Collimator designs: Pencil beam, Fan beam, Cone beam CT & MRI, Z-axis collimation, detector design – construction and working - Gas filled detectors – solid state detectors – flat panel detectors.

3. Principles of tomography: advantages and limitations – generations – spiral CT & MRI –slip ring technology – Multi slice CT & MRI – dual source CT & MRI - pitch – rotation time.

4. Basic principles of Image Reconstruction: Back projection, analytical an iterative methods – MPR – MIP – volume rendering – surface shaded display (SSD) – bone reconstruction.

5. CT artefacts: motion artefacts, streak artefacts, ring artefacts, partial volume artefacts etc. causes and remedy.

6. Dose and Dosimetry: CT & MRI Dose Index (CTDI, etc.), Multiple Scan Average Dose (MSAD), Dose Length Product (DLP), Dose Profile, Effective Dose, Phantom Measurement Methods, Dose for Different Application Protocols, Technique Optimization.

7. Advanced Computed Tomography & Magnetic Resonance Imaging: Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose, patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols – CT angiography – (Aortogram, selective angiogram head, neck and peripheral) image documentation and Filing, maintenance of equipment and accessories.

8. BASIC PRINCIPLE OF MRI
   A. NMR PARAMETERS
   B. LAMOR FREQUENCY
   C. IMAGING PRINCIPLE

9. BASIC PRINCIPLE OF MRI
   A. NMR PARAMETERS
   B. LAMOR FREQUENCY
   C. IMAGING PRINCIPLE

DIPLOMA IN CT & MRI TECHNICIAN

10. POSITIONING IN MRI, IMAGE WEIGHING AND CONTRAST IN MRI, ENCODING AND IMAGE FORMATION, PARAMETERS AND TRADE OFFS, PULSE SEQUENCES, FLOW PHENOMENA, ARTFACTS AND THEIR COMPENSATION, VASCULAR AND CARDIAC IMAGING, CONTRAST AGENTS IN MRI,
INSTRUMENTATION OF MRI SAFETY, CLINICAL APPLICATION OF MRI IN HUMAN DISEASE, COMPARISON OF MRI IN HUMAN DISEASE, COMPARISON OF MRI TO CONVENTIONAL RADIOGRAPHY AND CT.

3.Physics of CT & MRI Equipments

1. Identify the three major systems of a CT scanner and list the components of each.

2. Describe the components of the CT gantry (including the x-ray tube and generator, as well as the data acquisitions system), and the basic features of the patient table.

3. Describe the following three elements of a CT computer and image processing system: -processing architecture -hardware -software

4. Describe the characteristics of image display, storage, and recording in CT.

5. Describe the main components of a CT control console.

6. Describe several hardware and software options for CT.

7. Identify accessories for use in CT.

8. Describe briefly what is meant by each of the following: -modular design concept -operating modes of the scanner

9. Describe a typical room layout for a CT scanner.

10. Identify the major technical specifications and features of a CT scanner.

4. CT & MRI Techniques

1. **C.T. Scan**

Basic principle of CT scan, history of CT Scan, EMI, advantages and disadvantages, Equipment description

2. **Computed Tomography**

Scanning principle, Image acquisition, Image reconstruction, Image manipulation, Image display and documentation, Scanning parameters

3. **Generation of CT scanner**

DIPLOMA IN CT & MRI TECHNICIAN

Advantages and disadvantages

4. **NCCT & CECT**

Brain, Face, Sinuses, Neck, Mastoid, Temporal Bone (HRCT), Pituitary, IAC, Thorax (Routine & HRCT), Abdomen, Pelvis, Extremities: Indications. Contraindications, Patient preparation, Protocols and patient care.

5. **Artefacts**

CT scanner artefacts and their correction.

6. **Contrast media used in CT**

Dose, indications, contra indications and adverse effects. Emergency drugs stored in CT scan room.

7. **Quality assurance and quality control**

Purpose, Benefit and record maintaining or QA & QC

5.Slice Anatomy & Pathology

1. Physics Basic Principles of C.T & MRI Scan, Discovery of C.T & MRI Scan

2. CT & MRI slices—Axial, coronal and sagittal sections of Brain and Spine. 20 Hrs

3. CT & MRI —Axial, coronal and sagittal sections of Orbit. 05 Hrs

4. CT & MRI —Axial, coronal and sagittal sections of PNS 05 Hrs

5. CT & MRI —Axial, coronal and sagittal sections of Neck. 10 Hrs

6. CT & MRI —Axial, coronal and sagittal sections of Thorax. 10 Hrs

7. CT & MRI —Axial, coronal and sagittal sections of Abdomen. 10 Hrs

8. CT & MRI —Axial, coronal and sagittal sections of Pelvis. 10 Hrs

9. CT & MRI —Axial, coronal and sagittal sections of Limbs. 10 Hrs

10. CT & MRI —Axial, coronal and sagittal sections of Hepatobiliary System. 10 Hrs

11. CT & MRI —Axial, coronal and sagittal sections of KUB 10 Hrs

12. Various positions used in during CT & MRI Scan. Slice Anatomy & Pathology

Practical

PARAMEDICAL COUNCIL OF INDIA

Ch. No.157/1,Near Laxmi Nagar,Metro Station Gate No 1,Vikas Marg,Delhi-92

DIPLOMA IN CT & MRI TECHNICIAN

Observership for:-

1. Preparation of patient for CT & MRI Scan.

2. Performing all types of CT & MRI Scan.

3. Contrast administration & management of adverse reactions to it.

4. Protection from radiation hazards.

5. Assisting CT & MRI guided procedures.

6. Developing film.

7. Record keeping

SECOND PAPER : SYLLABUS COVERS

1) GENERAL RADIOGRAPHY (CT, USG, CONTRAST MEDIA)

1.**Radiography:** Primary radiological iamge-Image produced by contrast mediaAttenuation-Linear and mass attenuation coefficient-Factors affecting attenuationapplication in radiology-Filters-inherent and added filters-Heavy metal filters-X-ray beam restrictors-aperture diaphragm-cones and cylinders-collimators-function of restrictor

2.**Scattered radiation:** significance of scatter-Grid ,principle, design and type-evaluation of grid performance-lead content-Grid cut off-moving girds-Grid selection-air gap technique

3.Fluoroscopy: Direct fluoroscope-Image intensifier design—brightness gain-Imaging characteristics—multi field image intensifiers-Close circuit television-television scanning- television image quality-Fluoroscopic image recorders-TV image recorders. - 7 - 7

4. Radiographic image: Image clarity-contrast- factors affecting contrast-Image qualitymottle, sharpness and resolution-Line spread function-Modulation transfer functionNoise and wiener spectrum. Magnification-distortion-penumbra-un sharpness-inverse square law-evaluation of resolution- quantum mottle-patient exposure

5.Body section radiography: Basic method of tomography-terminology-blurring-section thickness-narrow and wide angle tomography-circular tomography-

tomographic motionsphantom images-tomographic angle determination-phantomography. Stereoscopy- physiology of depth perception-stereoscopic filming—viewingmerits and demerits

6.Mammography: Technical aspects of Mammograhy, generator, x-ray tubes, Accessories, Resolution, quality control. Application and role in medicine. Xeroradiography-principles-xeroradiographic plate powder development-image development- image quality-liquid toner xeroradiography.

7.Ultrasound: Physical characteristics of sound--transducer- characteristics of ultrasound beam- interaction of ultrasound and matter-quarter wave matching-ultrosonic displayimaging principles-Doppler techniques-real time ultrasound-ultrasound instrumentationbio effects and safety considerations.

2.RADIOPHYSICS, RADIOGRAPHIC POSITIONS & RADIATION HAZARDS

INTRODUCTION TO Physics

1. Radiologic Physics,Electromagnetic radiation,Neil's Bohr Atomic model,Atomic number,Mass number,Isotopes, Valency.
2. Ionization
3. X-Ray Physics,Discovery of X-Ray, Roentgenology, Fluroscopy,Nature of X-Ray,Wave length and Frequency Sources of X-Ray,X-Ray Tube & x ray control pane X ray circuit.
4. Necessary Conditions for the production of X-Ray
5. Efficiency of X-Ray Production,properties of X-Ray, Quality and Quantity of X-Ray.
6. Basics of CT PHYSICS, Basics of multislice C.T. physics

RADIATION

1. Radiation Dose,Radiation Hazards,Radiation Protection
2. Dark Room

PARAMEDICAL COUNCIL OF INDIA

Ch. No.157/1,Near Laxmi Nagar,Metro Station Gate No 1,Vikas Marg,Delhi-92

DIPLOMA IN CT & MRI TECHNICIAN

RADIOGRAPHY

1. Concepts of Radiographic Positioning
2. Scaphoid & hand.
3. Elbow & shoulder joint.
4. Foot AP & oblique
5. Hip & Knee joint AP.
6. Pelvis AP.
7. Chest AP, PA & Lat.
8. Sub Mento vertical & PNS.
9. Skull and Towne's.
10. Abdomen Erect.
11. BARIUM Studies.
12. IVP
13. MCU/RGU/ T tube cholangiogram/ HSG
14. Sinogram.
15. Contrast-Media,Radiographic Contrast, Density, Detail.
16. Types of film, Cassette, Intensifying Screen.
17. .Safe Light,Developer and Fixer,Manual Processing.
18. .Causes of film fog, Factors of X-Ray.

3. **CT GUIDED PROCEDURES**

1. C.T. Myelogram /cisternogram.
2. CT Guided FNAC / biopsy.
3. Other Special C.T. Procedures & common interventions.
4. C.T Enteroclysis/ CT IVP/ dual phase CT.
5. CT Angiography, mainly brain.

DIPLOMA IN CT & MRI TECHNICIAN

4. BIO-MEDICAL PHYSICS OF CT SCAN MACHINE & DEVELOPEMENT OF CT FILM ETC.

1. Basic Bio-medical physics of CT Scan machine.

2. Types of film, cassette, screen, Developer, fixer etc.