Radiological Imaging Technique

SYLLABUS

Semester V

Radiotherapy Planning and quality control-I

Objective:

Study and planning of radiotherapy for the sufferings and how to improve the quality of life and also study about the various aspects of the quality control.

Course contents: (30Hrs)

1. Definition of treatment planning
2. Planning procedure in general with special emphasis on turnout localization and target volume measurement by conventional radiographic method and simulator imaging.
3. Role of special contrast medium base radiotherapy
4. CT/MRI/Ultrasound/radionuclide imaging methods physical and clinical requirements of field selection of treatment in Teletherapy, role of portal films in treatment planning. Choice of central axis percentage depth dose data and isodose curve form a spectrum of radiotherapy beams used treatment.
5. Requirements and practice of organ shielding single multiple fields, and rotational field therapy, planning procedure.

Practicals: (10Hrs)

1. Patient preparation.
2. Pre requisites before starting the treatment.
3. Recommendations for dosimetric and geometric accuracy
4. How to express deviations between measurements and calculations
5. Evaluation in low dose gradient areas
6. Evaluation in high dose gradient areas
7. Combined evaluation of dosimetric and spatial deviations

Reference Books:

Sr.No	Author's Name	Name of the Books

1.	Walter's & Miller's	Textbook of Radiotherapy
2.	Charle's M Washington	Principle and Practice of Radiation Therapy
3.	Faiz M Khan	Treatment Planning in Radiation Oncology
4.	Jiade J Lu	Stereotactic body Radiation Therapy
5.	Anna Barrett	Practical Radiotherapy Planning
6.	Michael C Joiner	Basic clinical Radiobiology

Radiological Imaging Technique

SYLLABUS

SEMESTER – V

Quality Control in Diagnostic Radiology

Objective :

Improve the quality of imaging thereby increasing the diagnostic value; to reduce the radiation exposure; Reduction of film wastage and repeat examination; to maintain the various diagnostic and imaging units at their optimal performance.

Course contents: (30Hrs)

1. Objectives of quality Control: Improve the quality of imaging thereby increasing the diagnostic value; to reduce the radiation exposure; Reduction of film wastage and repeat examination; to maintain the various diagnostic and imaging units at their optimal performance.
2. Quality assurance activities: Equipment selection phase; Equipment installation and acceptance phase; Operational phase; Preventive maintenance.
3. Quality assurance programme at the radiological faculty level: Responsibility; Purchase; Specifications; Acceptance; Routine testing; Evaluation of results of routine testing; Quality assurance practical exercise in the X ray generator and tube; Image receptors from processing; Radiographic equipment; Fluoroscopic equipment; Mammographic equipment; Conventional tomography; Computed tomography; Film processing, manual and automatic; Consideration for storage of film and chemicals; Faults tracing; Accuracy of imaging- image distortion for digital imaging devices. LASER printer calibration
4. Quality assurance programme tests: General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually – machine calibration. Basic concepts of quality assurance – LASER printer - Light beam alignment; X-ray out-put and beam quality check; KVp check; Focal spot size and angle measurement; Timer check; mAs test; Grid alignment test; High and low contrast resolutions; Mechanical and electrical checks; Cassette leak check; Proper screen-film contact test; Safe light test; Radiation proof test; Field alignment test for fluoroscopic device; Resolution test; Phantom measurements - CT, US and MRI.
5. Quality assurance of film and image recording devices: Sensitometry; Characteristic curve; Film latitude; Film contrast; Film speed Resolution; Distortion; Artifacts of films and image recording. Monitor calibration. SMPTE pattern
6. Maintenance and care of equipment: Safe operation of equipment; Routine cleaning of equipment and instruments; Cassette, screen maintenance; Maintenance of automatic processor and manual processing units; Routine maintenance of equipments; Record keeping and log book maintenance; Reject analysis and objectives of reject analysis programme.
7. Care and maintenance of diagnostic equipment: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually.

Practicals: (10Hrs)

1. Routine cleaning of equipment and instruments; Cassette, screen maintenance; Maintenance of automatic processor and manual processing units.
2. Grid alignment test.
3. X-ray out-put and beam quality check; KVp check; Focal spot size and angle measurement; Timer check; mAs test.
4. Resolution test-CT and MRI.
5. QC of CT & MRI.

Reference Books:

Reference Books:

1. H. E. Jones, J. R. Cunningham, The Physics of Radiology, Charles C. Thomas, New York, 2002.
2. W. J. Meredith and J. B. Massey, Fundamental Physics of Radiology, John Wright and Sons,U. K., 2000.
3. W. R. Handee, Medical Radiation Physics, Year Book Medical Publishers Inc., London, 2003.
4. Donald T. Graham, Paul J. Cloke, Principles of Radiological Physics, Churchill Livingstone, 2003
5. R.F.Coughlin and F.F.Driscoll,'Operational amplifiers and linear integrated circuits', (6 th edition), Pearson Education Inc., New Delhi, 2001.
6. T. L. Floyd, Digital Fundamentals, (8 th deition), Pearson education Inc., New Delhi, 2003.
7. S.Brown and Z.Vranesic,'Fundamentals of digital logic with Verilog design', TataMcGraw Hill Publ Co.Ltd., New Delhi, 2003.
8. H.Skalsi, "Electronic instrumentation (2 nd edition), Tata McGraw Hill Publ. Co. Ltd., New Delhi,2004
9. J. P. Woodcock, Ultrasonic, Medical Physics Handbook series 1, Adam Hilger, Bristol, 2002.
10. J. R. Greening, Medical Physics, North Holland Publishing Co., New York, 1999.
11. R. Pratesi and C. A. Sacchi, Lasers in Photomedicine and Photobiology, Springer Verlag, West Germany, 1980.
12. Harry Moseley, Hospital Physicists' Association, Non-ionising radiation: microwaves, ultraviolet, and laser radiation, A. Hilger, in collaboration with the Hospital Physicists' Association, 1988
13. H. E. Jones, J. R. Cunningham, The Physics of Radiology, Charles C. Thomas, New York, 2002.
14. W. J. Meredith and J. B. Massey, Fundamental Physics of Radiology, John Wright and Sons,U. K., 2000.
15. W. R. Handee, Medical Radiation Physics, Year Book Medical Publishers Inc., London, 2003.

16. Donald T. Graham, Paul J. Cloke, Principles of Radiological Physics, Churchill Livingstone, 2003

Radiological Imaging Technique

SYLLABUS

SEMESTER – V

Physics of Advanced Imaging Technology-I

Objectives:

To understand the basic physics of advance imaging techniques that what principle and theory occurs behind these technologies.

Course contents: (30Hrs)

Computed Tomography

1. Basic Computed Tomography
2. Basic principles of CT
3. Generations of CT
4. CT instrumentation
5. Image formation in CT
6. CT image reconstruction, Hounsfield unit, CT image quality, CT image display
7. Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images
8. CT artefact

Magnetic Resonance Imaging

1. Advanced technique & instrumentation of MRI
2. Basic Principles: Spin – precession – relaxation time – pulse cycle – T1 weighted image – T2 weighted image – proton density image.
3. MR Instrumentation: Types of magnets – RF transmitter – RF receiver – Gradient coils – shim coils – RF shielding – computers.

Ultrasonography

1. Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity.
2. Interaction of US with matter: reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, US machine controls, US focusing.
3. Production of ultrasound: Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam.

4. Ultrasound display modes: A, B, M

Reference Books:

Reference Books:

1. R.F.Coughlin and F.F.Driscoll,'Operational amplifiers and linear integrated circuits', (6 th edition), Pearson Education Inc., New Delhi, 2001.
2. T. L. Floyd, Digital Fundamentals, (8 th deition), Pearson education Inc., New Delhi, 2003.
3. S.Brown and Z.Vranesic,'Fundamentals of digital logic with Verilog design', TataMcGraw Hill Publ Co.Ltd., New Delhi, 2003.
4. H.Skalsi, "Electronic instrumentation (2 nd edition), Tata McGraw Hill Publ. Co. Ltd., New Delhi,2004
5. J. P. Woodcock, Ultrasonic, Medical Physics Handbook series 1, Adam Hilger, Bristol, 2002.
6. J. R. Greening, Medical Physics, North Holland Publishing Co., New York, 1999.
7. R. Pratesi and C. A. Sacchi, Lasers in Photomedicine and Photobiology, Springer Verlag, West Germany, 1980.
8. Harry Moseley, Hospital Physicists' Association, Non-ionising radiation: microwaves, ultraviolet, and laser radiation, A. Hilger, in collaboration with the Hospital Physicists' Association, 1988
9. H. E. Jones, J. R. Cunningham, The Physics of Radiology, Charles C. Thomas, New York, 2002.
10. W. J. Meredith and J. B. Massey, Fundamental Physics of Radiology, John Wright and Sons,U. K., 2000.
11. W. R. Handee, Medical Radiation Physics, Year Book Medical Publishers Inc., London, 2003.
12. Donald T. Graham, Paul J. Cloke, Principles of Radiological Physics, Churchill Livingstone, 2003

Radiological Imaging Technique

SYLLABUS

SEMESTER – V

Advanced Radiographic Imaging Technology-I

Objective:

To understand the principle, working and study the various protocols under which various types of scan are done.

Course contents: (30Hrs)

MRI(Magnetic Resonance Imaging):

A. Indication, Contraindication, Patient Preparation & Positioning

I. Indication

II. Contraindication

III. Preparation of the patient

B. Wrist joint

I. Carpal tunnel syndrome

C. Degenerative diseases of spine

I. Spondylysis

II. Disk buldge

III. Disk herniation

IV. Metastatic diseases

V. Trauma & Tumors

D. Infections of the spine

I. Tuberculosis & Pyogenic infections

E. Basic MRI Pathologies

I. Bone tumor

- Introduction
- Basic view
- Classification
- Benign bone tumor & Malignant bone tumor

II. Central nervous system

- Dandy walker malformation
- Arnold chiari malformation
- Intracranial infection
- White matter disease
- Dysmyelination disease

- Intracranial hemorrhage
- Hypoxic ischemic encepalopathies
- Intracranial neoplasm

Practicals: (20Hrs)

1. Case summary
2. Patient preparation
3. MRI Brain
    - Contraindications
    - Positioning for MRI brain
    - Indications
    - Protocol for MRI Brain imaging
    - Various parameters used in protocol of MRI Brain imaging
4. MRI of Soft Tissues of the Neck
5. MRI of chest
    - Modifications
    - MRI of the Chest Wall and
    - Mediastinum
6. MRI of Sternum
    - Modifications
    - Contrast MRI of the Sternum

7. Magnetic Resonance Imaging: Abdomen, Pelvis

    A. Abdomen/Liver
        - Modifications
        - Liver MRI with Superparamagnetic Contrast Agent
        - Biliary Tree
        - MRI of the Small Intestine
        - Pancreas

        a) Modifications

        b) Biliary Tree and Pancreatic duct

        c) Dynamic Contrast Series

d) Secretin-Enhanced MR Pancreatography

- Kidney
  a) Modifications
  b) MR urography
- Adrenal gland
  a) Modifications
  b) Dynamic series
- Pelvis
  a) Uterus
  b) Vagina
  c) Bladder
  d) Prostate
  e) Testes

Reference Books:

1.	Dr.Khanduri.S	A Textbook of CT & MRI for Technicians.
2.	Dr.Bhadury. S.	Essentials of radiology & imaging
3.	Bhargava. S.k.	Radiological procedures
4.	Bhargava, S.k.	Textbook of radiology and imaging
5.	Eisenberg	Clinical Imaging
6.	Haaga	CT and MRI of the whole body
7.	Hosten	CT of the head & Spine
8.	Leeuwen	Imaging in Hepatobiliary and Pancreatic Disease
9.	Siegel	Pediatric Body CT
10.	Moran	Tumors & Tumor-like conditions of the Lung and Pleura
11.	Bluth. E.I.	Ultrasound a practical approach to clinical problems