DIPLOMA IN X-RAY TECHNOLOGY

Anatomy& Physiology

1. **Introduction:-** Definition- Anatomy, Physiology ,Basic medical terminology(Body cavities, planes, general organization of the body).

2. **Cell & Tissue:-** Basic organization of cell- Mitochondria, Golgibody, Ribosomes, Endoplasmic reticulum, Nucleus, Tissues , Types of tissues and their functions.

3. **Skeletal system:-** Classification of Bones, Upper extremity, Lower extremity, Vertebral column, Skull Bones, Ribs Synovial joints, Joint diseases.

4. **Cardiovascular System-** Blood, Heart(Structure and functions), Cardiac Cycle, Cardiac output, Blood pressure, Heart sound, Blood Vessels, Circulation (Pulmonary & Systemic)
5. **Respiratory System:-** Nose, Pharynx, Larynx Trachea, Bronchi, Lungs, Function of Respiratory tract, tidal volume, residual volume, Reserve Volume.

6. **Digestive System:-** Mouth, Oesophagus, Salivary glands, Stomach, Small Intestine, Large Intestine, Pancreas, Liver, Biliary system, General Principle of Digestion.

7. **Excretory System:-** Kidney, Function & internal Structure and formation of Urine, ,Nephron-Structure and functions, Ureter, Urinary Bladder, Urethra, Micturation.

8. **Reproductive System:- i)** Male reproductive System- Testes, Scrotum, penis, glands **ii) F**emale reproductive System- Ovaries, Fallopian tubes, Vagina, Breast , Female reproductive cycle , Menstruation , Fertilization.

9. **Endocrine glands:-**Types of glands, Types of endocrine glands, Pituitary gland, Pineal gland, Thyroid gland, Adrenal gland, Parathyroid gland, Pancreas, Gonads.

10. **Nervous System:-** Nerve cell structure and function, Central nervous system, Peripheral nervous system, Automatic nervous system, Brain-parts and functions, Function of CSF, spinal cord, nerves.
11. **Integumentary system-** Skin(Introduction, Structure, Function), hair, nails, exocrine glands.
12. **Lymphatic System:-** Introduction, Structure Function, location, spleen

DRIT- Anatomy and Physiology

List of Practicals -

1. Diagrammatic representation of Mitochondria.
2. Diagrammatic representation of Endoplasmic Reticulum.
3. Diagrammatic representation of Nucleus.
4. Diagrammatic representation of Skull.
5. Diagrammatic representation of Femur.
6. Diagrammatic representation of Pelvis.
7. Diagrammatic representation of Scapula.
8. Diagrammatic representation of Heart.
9. Diagrammatic representation of Lungs.
10. Diagrammatic representation of Kidney.
11. Diagrammatic representation of Liver.
12. Diagrammatic representation of Pancreas.
13. Diagrammatic representation of Spleen.
14. Diagrammatic representation of Nervous System.
15. Diagrammatic representation of Ovary.

Darkroom

1. Introduction to darkroom
2. Darkroom construction – Features of an ideal darkroom (size, floor, ventilation, door, safelight, passbox)
3. Film- construction, types, maintenance , storage
4. Intensifying screen- construction, types, maintenance , storage
5. Cassette- construction, types, sizes maintenance , handling
6. Film processing – steps of processing(automatic processing and manual processing)
7. Processing chemicals- developing and fixing agent

Learning Outcome

1. Explain the principles of radiographic imaging
2. Apply knowledge of radiographic imaging to the production of radiographs
3. Understand the construction and operation of image processing equipment
4. Control and manipulate parameters associated with exposure and processing to produce a required image of desirable quality
5. Perform X-ray film/image processing techniques (including dark room)
6. Explain and implement the fundamentals, concepts and applications of processing of images in digital from using computer based systems
7. Carry out quality control for automatic film processing, evaluate and act on results

General Radiation Physics

1. Basic Physics- Electricity, Energy, Forms of energy, Work, Velocity, S.I units, Electric charge, magnetism, Voltage, Electromagnetic spectrum, Radiation .
2. Radiation Units-Exposure, KERMA, Absorbed dose, Effective dose, Equivalent dose, maximum permissible doses.
3. X-ray physics-Properties of X-rays , History of X-rays, X-ray production, types of x-ray production- Bremsstrahlung radiation, Characteristic radiation.
4. X-ray tube – Construction, Working, Types of X-ray tube, Tube failure, X-ray tube circuits, Exposure factors.
5. Image quality parameters- Contrast, resolution, Fog, Density, Sharpness.
6. Image artifacts- Metal artifact, Chemical artifact, patient based artifacts, processing artifacts, film handling artefacts.
7. Radiographic Grids- Construction, Types, Grid ratio, Working, Advantages , Disadvantages, Bucky.
8. X-ray tube filter- Construction, Types, Working, Advantages , Disadvantages.
9. X-ray beam restricting devices- Collimators, cone, cylinders.
10. Radiation hazards- Somatic effects, late effects, stochastic effect, deterministic effects.
11. Radiation monitoring devices – TLD badge, Film badge, Ionization chamber.
12. Radiation protection basic principles- ALARA, Time, Distance ,Shielding, lead apron, shielding devices.
13. Advanced diagnostic modalities- Brief introduction about Computed Tomography, Magnetic Resonance Imaging, Mammography, Ultrasonography, Computed Radiography.

Radiography and Photography Techniques

1. Contrast media- Brief introduction, Types of contrast media, Iodinated C.M, Barium C.M, Adverse reactions of contrast media.
2. IVP
3. Barium procedures- Barium swallow,Barium meal, Barium meal follow through, Barium Enema.
4. H.S.G
5. Sialography
6. M.C.U
7. Dacrocystography
8. R.G.U

Learning Outcome

Equipment and Positioning

1. Position the patient correctly for an X-ray in the following Positions:

- Erect
- Sitting
- Supine
- Prone
- Lateral
- Oblique

2. Explain relative positions of x-ray tube and patient and the relevant exposure factors related to these

a) Explain the use of accessories such as Radiographic cones, grid and positioning aids
b) Explain the anatomic and physiological basis of the procedure to be undertaken
c) Explain the radiographic appearances of both normal and common abnormal conditions where elementary knowledge of the pathology involved would ensure application of the appropriate radiographic technique
d) Explain the instruments of radiation protection, use of gonad shield and practical methods for reducing radiation dose to the patient
e) Ensure protection of self, patients, departmental staff and public from radiation through use of
protection instruments and monitoring personnel and the work area.

Radiographic Positioning
Practical Syllabus

1. Demonstration of radiographic positioning

2. Demonstration of X-Ray tube & accessories.

3. Upper Extremity: X-Ray projections of
   a) Hand- PA/Lateral
   b) Arm (Humerus)- AP/Lateral
   c) Wrist – AP/Lateral
   d) Fore Arm – AP/lateral
   e) Elbow – AP/ Lateral
   f) Shoulder – AP

4. Lower Extremity: X-Ray projections of
   a. Foot – AP(Dorsoplantar/Lateral)
   b. Ankle – AP/Lateral
   c. Leg – AP/Lateral

d. Thigh(Femur) – AP/Lateral

e. Pelvis – AP
f. Knee –AP/Lateral/Skyline

5. Chest
   a) Chest –PA/Lateral/oblique
   b) Chest –Lordotic

6. Abdomen : X-Ray projection
   - Abdomen – AP (Supine/Erect), Lateral

7. Vertebral Column: X-Ray Projection
   a) Lumbar Spine – AP/Lateral
   b) Thoracic Spine – AP/Lateral
   c) Cervical Spine - AP/Lateral

8. Skull : X-ray Projection
   a) Skull – PA/ Lateral
   b) Skull – Towne Projection
   c) Skull – SMV Projection
   d) Paranasal sinuses (Waters View / Lateral)

Biomedical Waste Management
(10 hrs)

1. Follow the appropriate procedures, policies and protocols for the method Of collection and containment level according to the waste type
2. Apply appropriate health and safety measures and standard precautions for infection prevention and control and personal protective equipment relevant to the type and category of waste
3. Segregate the waste material from work areas in line with current Legislation and organisational requirements
4. Segregation should happen at source with proper containment, by using different colour coded bins for different categories of waste
5. Check the accuracy of the labeling that identifies the type and content of waste
6. Confirm suitability of containers for any required course of action appropriate to the type of waste disposal
7. Check the waste has undergone the required processes to make it safe for transport and disposal

8. Transport the waste to the disposal site, taking into consideration its associated risks

9. Report and deal with spillages and contamination in accordance with Current legislation and procedures
10. Maintain full, accurate and legible records of information and store in Correct location in line with current legislation, guidelines, local policies and protocols

Learning Outcome

1. Classification of the waste generated
2. Segregation of Biomedical Waste
3. Proper collection and storage of waste