

Learning Outcomes:

The educational objectives of the course are to educate students to attain the following:

- Recognize and explain the X-ray machine parts
- Understand the influence of material and atomic energy levels in X-ray production
- Realization of the factors affecting X-ray quality and Quantity
- predict the type of X-ray interaction occurring with tissues
- Understanding of ultrasound waves properties and their interaction with tissue
- Understanding of principles of various ultrasound modes and realizing their applications

SYLLABUS

Unit No.	Topics	Lectures (Hours)
1	Introduction to the overview and importance of the course:	1
2	Fundamentals of X-ray: Ionization principle, Units of Radiation, Electromagnetic Radiation, properties of X-ray, X-ray Beam Quality controlling factors & Quantity controlling factors, X-ray potential hazards, Dose limits for patients and workers.	4
3	X-ray Machine Components: X-ray tube Internal structure: Cathode-filament, focusing cup, Stationary and rotating Anode with their functions, target material, Dual focus tube, Filters: inherent and added filters, Grids, X-ray film, Intensifying Screens. Block diagram of X-ray Machine	8
4	Generation and Detection of X-rays: X-ray production i.e. electron target interaction K-characteristics and Bremsstrahlung, Interactions between X-rays and Matter: Photon scattering – elastic and Compton scattering, Photon disappearance - photo electric, pair production process and photonuclear reactions and their significance in radiology.	5
5	Digital Radiography: Digital Radiography - discrete digital detectors, storage phosphor and film Scanning, Fluoroscopy, Digital Subtraction Angiography, Mammography: Basic principles and working.	8
6	Introduction of ultrasonic wave: Fundamentals of Acoustic Propagation, Acoustic impedance, Reflection and Refraction, Attenuation, Scattering, absorption of ultrasonic energy, velocity of propagation, Doppler effect.	6
7	Ultrasound beam characteristics: Huygens principle, Beam profile for continues and pulsed ultrasound waves, Axial and lateral resolution, Focusing.	4
8	Ultrasound Imaging: Capture and display principles of A-Mode- Echo-ophthalmoscope and Echoencephalograph, B-Mode, M-Mode-, Echocardiography, Color Doppler flow imaging, Duplex Imaging, clinical use of ultrasound, Biological effects and safety	9

Term Work and Practical shall be based on the above syllabus.

Text Books:

1. Radiologic science for Technologists By Stewart C. Bushong.
Pub: Mosby: A Harcourt Health Sciences Company.
2. Principles of Medical Imaging By K. Kirk Shung, Michael B. Smith, Benjamin Tsui.
Pub: Academic Press

Reference Books:

1. Handbook of Bio-Medical Instrumentation By R. S. Khandpur
Pub: Tata McGraw Hill.
2. Fundamentals of Medical Imaging By Paul Suetens
Pub: Cambridge University Press
3. Introduction to Biomedical Equipment Technology By Carr & Brown,
Pub: Pearson Education, Asia.