

**COURSE TITLE: RADIATION PHYSICS I , FILMS & DARK ROOM  
TECNIQUES AND CLINICAL PRACTICE**

**STUDY HOURS: 60+160**

**PAPER: 01**

**Term : 4<sup>th</sup>**

**MARKS**

**THEORY 120**

**PRACTICAL: 30**

**TIME: 03HRS**

**COURSE CONTENTS STUDY HOURS  
(Theory +Practical)**

**A. RADIATION PHYSICS I**

**20+60**

- A.1 Structure of atom, definitions of terms.
- A.2 Electromagnetic radiation theory and proprieties.
- A.3 Wave theory and quantum theory of radiation.
- A.4 Visible light and fluorescence.
- A.5 The properties of x-rays.
- A.6 The production of x-rays and interaction with targets.
- A.7 Spectra of x-rays.
- A.8 The factors affecting quantity and intensity.
- A.9 The thermianic emission of cathode.
- A.10 Principle of x-rays tubes.
- A.11 Practical aspects of x-rays.
- A.12 Triode valve and semiconductors.
- A.13 Cathode ray oscilloscopes.
- A.14 Introduction to higher voltage rectifier circuits.
- A.15 Self-rectifying circuits.
- A.16 Half wave and full wave pulsating voltage circuits.
- A.17 Constant potential circuits.
- A.18 The measurement of higher voltage.
- A.19 Introduction to x-ray control-ray tube voltage (kV.),X-Ray tube current (M.A.).
- A.20 Exposure controls.

**B. FILMS AND DARK ROOM TECHNIQUES.**

**40+100**

**Physical Basis of Radiography.**

- B.1 Image formation, distortion and blurring.
- B.2 Composition and constituents of x-rays films.
- B.3 Effects of x-rays on x-ray film sensitivity.
- B.4 Methods of storage of films.
- B.5 Introduction to fluoesenence, Fluorescent materials.
- B.6 Purpose and methods of using fluorescent screen intensifying screens.
- B.7 Physical construction of screens, cassettes and film holders.
- B.8 Intensification factors.
- B.9 Screens for multisection tomography.
- B.10 Care and safety of screens and x-rays cassettes.

- B.11 Variation of films and screens with patients thickness and an anatomical structure.
- B.12 Focal film distance, speed of films, speed of screens.
- B.13 Methods of film labeling and identification, sizes etc.
- B.14 Chemicals used in film development.
- B.15 Film development with manual and automatic techniques.
- B.16 Defects in films.
- B.17 Introduction to automatic developers, materials used.
- B.18 Introduction to different types of contrast media, official and trade names.
- B.19 Contrast media dosage-methods and procedures.
- B.20 Side effects of contrast media and reactions.
- B.21 Treatment of reactions from contrast media.
- B.22 Types of films used in ultrasound Methods of storing.
- B.23 Use of computers in recording and storage of images.
- B.24 Store keeping in radiology.
- B.25 Inventory and ordering and reordering in radiology.

**RECOMMENDED BOOKS:**

- 1 Physics for radiology students by Dr. M. B Zaffar.
- 2 First year physics for radiographer by E. Hughes.
- 3 X-Ray equipment for students radiographers by BN & MO Chesney.
- 4 Medical X-Ray Techniques and diagnostic radiology by Ploot Publishers.
- 5 Merrills atlas on radiographic position and radiological procedures vol I, II & III by Phillip W Belliager.

**Reference books:**

- 1 Text books radiology for residents and technicians by Satish K Bhargava.
- 2 X-Ray Diagnosis and imaging, Ultrasound, CT Scan, MRI and Radiosotope imaging.

**COURSE TITLE: ELECTRO MAGNETISM & RADIATION PHYSICS II  
AND CLINICAL PRACTICES**

**STUDY HOURS: 60+160**  
**PAPER: 02**  
**TERM: 4<sup>th</sup>**

**MARKS**  
**THEORY 120**  
**PRACTICAL: 30**  
**TIME: 03HRS**

**COURSE CONTENTS STUDY HOURS  
(Theory +Practical)**

**A. ELECTRO-MAGNETISM 40+100**

- . A.1 Introduction to the course.
- . A.2 The structure of the atom.
- . A.3 Isotopes.
- A.4 Ionization and excitation.
- A.5 Electric charges.
- A.6 Electric introduction-electroscopes.
- A.7 Electric charge an electrical potential.
- A.8 Capacitance and capacitors.
- A.9 Electric current-ampere, volt, resistance.
- A.10 Resistance and ohms law.
- A.11 Circuit laws.
- A.12 Energy and power.
- A.13 The heating effect of electric current.
- A.14 Sources of electrical energy.
- A.15 Magnetism-introduction.
- A.16 The magnetic effect of electric current.
- A.17 Application of magnetic effect.
- A.18 Electro-magnetic induction.
- A.19 Mutual induction and self-induction.
- A.20 Introduction of A.C.
- A.21 Transformer-theory.
- A.22 Transformer-practical aspects.
- A.23 Introduction A.C. circuits.
- A.24 Reactance, resonance, impedance.
- A.25 Power factor-power in single-phase circuit.
- A.26 Single phase three phase, comparison and contrast.
- A.27 Electrical distribution system in Pakistan.
- A.28 Different supply systems.
- A.29 A.C.in three-phase system.
- A.30 Introduction to electrical machines.
- A.31 Generator-A.C.& D.C Principal working-main parts.
- A.32 Motor-Principle, Main parts working.
- A.33 Electrical measuring instruments and measurements.
- A.34 Indicating instrument-types, Principle and working.
- A.35 Thermionic emission and P.N. Junction.
- A.36 Diode structures and working.

- A.37 Characteristic of diodes.
- A.38 Triode-its working and characteristics.
- A.39 Rectification.
- A.40 Introduction to amplification.

## **B. RADIATION PHYSICS II**

**20+60**

- B. 1 Interaction of x and gamma rays with matter.
- B. 2 The transmission of a homogeneous beam through a medium.
- B. 3 Absorption and scattering process.
- B. 4 The transmission of a heterogeneous beam through a medium and filtration.
- B. 5 The transmission of a beam through body tissues.
- B. 6 Shapes and fine details in the X-Ray image.
- B. 7 Basis of X-Rays measurement exposure, half value longer, Dose equivalent and other methods.
- B. 8 Introduction to radioactivity-discovery, emission, transformation process and branching.
- B. 9 Radioactive decay, artificial or induced radioactivity, exposure rate constant and used of radio nuclides in medicine.
- B.10 Introduction to Radiation protection, maximum permissible dose, protective materials and radiation.
- B.11 Introduction to Nuclear medicine-properties of nuclides, organ specific up take detection of radiation, ratio nuclide imaging.
- B.12 Physics of ultrasound-nature, generation, power and intensity.
- B.13 transmission of ultrasound through matter, ultrasonic scans safety.
- B.14 Physical basis of tomography-introduction.
- B.15 Introduction to computer and computed tomography.
- B.16 Physics of magnetic resonance imaging.
- B.17 Introduction to laser and safety precaution concept of radiotherapy

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