

**RADIOGRAPHY LEVEL 1 COURSE OUTLINE (40 HOURS)**

**1.0 Introduction**

- 1.1 Electromagnetic energy
- 1.2 Wavelength
- 1.3 Photon energy

**2.0 Basic atomic physics**

- 2.1 Atomic number
- 2.2 Mass number
- 2.3 Isotopes
- 2.4 Ionization
- 2.5 Licenses and registration requirements

**3.0 Radioactivity**

- 3.1 Types of Ionizing radiation
  - 3.1.1 Alpha
  - 3.1.2 Beta
  - 3.1.3 Neutron
  - 3.1.4 Gamma
- 3.2 Making Isotopes
- 3.3 Commonly used Isotopes

**4.0 Film processing and the dark room**

- 4.1 Make up of double coated radiographic film
- 4.2 Film packaging
- 4.3 Handling of processing chemicals
- 4.4 Dark room
- 4.5 Dark room layout
  - 4.5.1 Entrances
  - 4.5.2 Dry side
  - 4.5.3 Wet side
- 4.6 Dark room lighting
  - 4.6.1 Safe lights
- 4.7 Chemical processing
  - 4.7.1 Developer
  - 4.7.2 Fixer
  - 4.7.3 Stop bath
  - 4.7.4 Wash
  - 4.7.5 Wetting agent
- 4.8 Drying
- 4.9 Film artifacts

**5.0 X-ray equipment and production**

- 5.1 Heat dissipation
- 5.2 Kilo voltage
- 5.3 Production of X-rays
- 5.4 Continuous (Bremsstrahlung) radiation
- 5.5 Characteristic radiation
- 5.6 Line focus principle
- 5.7 Hooded anode
- 5.8 360 degree emitter

- 5.9 Warm up cycle
- 5.10 Duty cycle
- 5.11 Radiation intensity
  - 5.11.1 mA control
- 5.12 X-ray penetration ability and kilo-voltage
- 5.13 High energy X-ray sources
  
- 6.0 Practical X-ray exposure calculations**
  - 6.1 Use of an X-ray exposure chart
  - 6.2 Characteristic curves
  
- 7.0 Mathematical calculations involving distance**
  - 7.1 The inverse square law
    - 7.1.1 Time-distance relationship
  - 7.2 mA-time relationship (Reciprocity law)
  
- 8.0 Radiographic film quality**
  - 8.1 Sensitivity versus time
  - 8.2 Image quality Indicators (IQI's)
    - 8.2.1 Plaque type IQI's
    - 8.2.2 Wire type IQI's
  - 8.3 Radiographic definition
  - 8.4 Scattered radiation
    - 8.4.1 Side scatter
    - 8.4.2 Internal scatter
    - 8.4.3 Back scatter
  - 8.5 Radiation interaction with the emulsion layer(s)
    - 8.5.1 Metal foil screens
    - 8.5.2 Fluorescent salt screens
  - 8.6 Radiographic image
  - 8.7 Radiographic contrast
    - 8.7.1 Subject contrast
    - 8.7.2 Film contrast
  - 8.8 Radiographic film types
    - 8.8.1 Graininess
    - 8.8.2 Film speed
    - 8.8.3 Latitude
    - 8.8.4 Definition
  
- 9.0 Industrial gamma ray equipment**
  - 9.1 Gamma isotope capsules
  - 9.2 Gamma camera
  
- 10.0 Radiation units for measurement of radioisotopes**
  - 10.1 Radiation activity
  - 10.2 Half life
    - 10.2.1 Half life formula
  - 10.3 Radiation intensity
  - 10.4 Specific emission constants
  
- 11.0 Radiation units for measurement of ionizing radiation**
  - 11.1 Radiation absorption
  - 11.2 Relative biological effectiveness
  - 11.3 Roentgen equivalent man

**12.0 Basic principles of radiation protection**

- 12.1 Time
- 12.2 Distance
- 12.3 Shielding
  - 12.3.1 Photo-electric effect
  - 12.3.2 Compton effect
  - 12.3.3 Pair production
  - 12.3.4 Practical use of shielding
- 12.4 Collimators
- 12.5 Half value layer
- 12.6 Radiation detection and monitoring
  - 12.6.1 Radiation survey meter
  - 12.6.2 Film badge
  - 12.6.3 Thermo-luminescent dosimeters
  - 12.6.4 Direct reading dosimeter
  - 12.6.5 Audible radiation alarm
- 12.7 Radiation emergency procedures

*TEST NDT does not have any pre-requisites for attending any of our courses, it is entirely up to the attendee to determine whether the course is suitable for their needs and whether they are capable of achieving the standards. Please study the applicable course outline and decide if the course is suitable for your needs before enrolling, if in doubt, please contact us to discuss. For employer funded attendees, please discuss the suitability of any of the courses with your employers responsible NDT level 3 before enrolling.*