

Course Objectives/Course Outline
Spokane Community College

Course Title: Radiographic Principles II

Prefix and Course Number: RAD 125

Course Learning Outcomes:

By the end of this course, a student should be able to:

- Identify the considerations that affect the recorded details of the radiograph
- Identify and control technical factors affecting image distortion, density and contrast
- Describe the interrelationships of radiographic image formation factors
- Define the properties and characteristics of x-rays
- Identify, define and discuss radiographic quality
- list the major sources of natural and manmade radiation
- define terms: exposure, absorbed dose, dose equivalent, gray, sievert, air kerma and their interrelationships
- define electromagnetic radiation (EM) and give examples of the general types of EM and the EM energy formulas
- recognize the wave formula and what it means
- define the half-value layer

Course Outline:

- I. Minimizing Patient Exposure
 - A. Using Geometric Functions
 - B. Using Visibility Functions
- II. Simplifying and Standardizing Techniques
 - A. Radiographic Quality (Seven)
 - B. Three Phases of Standardization
 - C. Optimum kVp Technique
 - D. Optimum mA Technique
 - E. Variable kVp Technique
- III. Technique Charts
 - A. Advantages
 - B. Disadvantages
 - C. Optimum kVp Chart Requirements
 - D. Optimum mA Chart Requirements
 - E. Variable kVp Chart Requirements
 - F. AEC Chart Requirements
- IV. Technique by Proportional Anatomy
- V. Beam/Part/Film Alignment
 - A. Off-centering and Beam Divergence
 - B. Effects on Geometric Functions
 - C. Effects on Visibility Functions
- VI. Geometric Functions
 - A. Routine Projections

- B. 4 Positioning Objectives
- VII. Motion
 - A. Voluntary/Involuntary Motion
 - B. 3 Ways to Control Motion
 - C. Effects on Geometric Functions
 - D. Effects on Visibility Functions
- VIII. Analyzing the Radiographic Image
- IX. Fluoroscopic Image Intensification
 - A. Image Intensifier
 - B. Beam Splitter
 - C. Automatic Brightness System Image
 - D. Image Recording Systems
 - E. C-arm
 - F. Minimizing Patient and Operator Exposure
- X. Concepts of Radiologic Science
 - A. Matter
 - B. Energy
 - 1. Potential energy
 - 2. Kinetic energy
 - 3. Chemical energy
 - 4. Electrical energy
 - 5. Thermal energy
 - 6. Nuclear energy
 - 7. Electromagnetic energy
 - C. Radiation
 - 1. Natural environmental radiation
 - 2. Man-made radiation
 - D. Fundamental Particles
 - 1. Electron
 - 2. Nucleons
 - a. Neutron
 - b. Proton
 - E. Atomic Structure
 - F. Electron Arrangement & Binding Energy
 - G. Atomic Nomenclature
 - 1. Isotopes
 - 2. Isobars
 - 3. Isotones
 - 4. Isomers
 - H. Radioactivity
 - 1. Radioisotopes
 - 2. Radioactive Half-Life
 - 3. Types of Ionizing Radiation
 - a. Alpha Particle
 - b. Beta Particle
 - c. Gamma Particle
- XI. Electromagnetic Energy
 - A. Photons
 - 1. Electromagnetic Energy

- B. Amplitude
- C. Frequency
- D. Wavelength
- E. Electromagnetic Spectrum
 - 1. Visible-light
 - 2. Radiofrequency
 - 3. Ionizing Radiation
- F. Wave-Particle Duality – define
 - 1. Wave Model: Visible light
 - a. Transmission
 - b. Absorption
 - c. Attenuation
 - d. Transparent
 - e. Translucent
 - f. Opaque
- G. Matter & Energy
 - 1. Law of Conservation of Matter
 - 2. Law of Conservation of Energy
- XII. Electricity, Magnetism & Electromagnetism
 - A. Electricity
 - 1. Electrostatics
 - 2. Electrification
 - 3. Electrostatic Laws
 - a. Attract/Repel
 - b. Coulomb's law
 - B. Electrodynamics
 - 1. Conductors
 - 2. Insulators
 - 3. Semiconductors
 - C. Electrodynamics
 - 1. Electric Circuits
 - 2. Ohm's Law ($V = IR$)
 - 3. Circuits
 - 4. AC & DC Currents
 - D. Magnetism
 - 1. Natural magnets
 - 2. Permanent magnets
 - 3. Electromagnets
 - E. Magnetic Laws
 - F. Magnetic Induction
 - G. Electromagnetism
 - 1. Solenoid
 - 2. Faraday's Law
 - 3. Lenz's Law
 - 5. Self-induction
 - 6. Mutual Induction
 - H. Electromechanical Devices
 - 1. Electric Generator
 - 2. Electric Motor

- I. Transformers
 - 1. Closed-core
 - 2. Autotransformer
 - 3. Shell-type
- XIII. The X-ray Imaging System
 - A. Autotransformer
 - 1. kVp
 - 2. mAs
 - 3. Filament transformer
 - B. Exposure Timers
 - 1. Synchronous
 - 2. Electronic
 - 3. mAs timers
 - 4. AEC
 - C. High-Voltage Generator
 - 1. High Voltage transformer