R T 55A: PRINCIPLES OF RADIOLOGIC TECHNOLOGY I

Foothill College Course Outline of Record

Heading	Value
Units:	3
Hours:	3 lecture per week (36 total per quarter)
Prerequisite:	R T 50; CHEM 25 or 30A.
Advisory:	Not open to students with credit in R T 52A.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- Describe the parts of the x-ray tube.
- Differentiate between the quality factors of mAs and kV.

Description

Introduction to elementary principles of x-ray physics, technique, radiation protection and digital radiography. Intended for students in the Radiologic Technology Program; enrollment is limited to students accepted in the program.

Course Objectives

The student will be able to:
A. Identify the components and functions of the x-ray tube.
B. Understand the relationship between mAs and kVp and radiographic density and contrast.
C. Identify the components and function of intensifying screens, radiographic film, grids and collimation devices.
D. Define radiographic equipment terminology.
E. Describe the operation and utilization of wet and dry processing.
F. Evaluate the differences in characteristics that are inherent in a film-based system and a cassette and cassette-less digital system.
G. Describe the method of image acquisition in a cassette and cassette-less digital system.
H. Distinguish and evaluate CR-based and DR-based image artifacts.

Course Content

A. Identify the components and functions of the x-ray tube
1. Discovery and history of x-rays
2. Properties of x-rays electromagnetic spectrum
a. Ionization
3. Production of x-rays, necessary conditions:
a. Cathode
1) Heating a filament
2) Releasing electron from filament
a) Thermionic emission
3) Directing electron path to target
b. Anode
1) Sudden stopping of electron at target
4. Effects of milliamperage and kilovoltage:
a. Patients
b. Radiographic film
1) Density
2) Contrast
5. Radiographic and Fluoroscopic x-ray units
a. Radiographic units for routine procedures
b. Fluoroscopic units for viewing internal organs
6. X-ray tube
a. History
b. Construction of the x-ray tube and housing
1) Molybdenum
2) Tungsten
3) Copper
4) Graphite
c. Production of x-ray
B. Understand the relationship between mAs and kVp and radiographic density and contrast
1. X-ray quantity determining factors
a. mAs
b. kV
c. Distance
d. Filtration
2. X-ray quality determining factors
a. kV
b. Filtration
3. mAs and density
4. kV and contrast
5. Computing density changes using 15% kVp rule
C. Identify the components and function of intensifying screens, radiographic film, grids and collimation devices
1. Intensifying screens
a. Construction and types of screens
1) Rare earth metals
b. Fluorescence
c. Phosphorescence
d. Screen artifacts
e. Computation of mAs conversion factors for instensifying screens
2. X-Ray film
a. Construction of film
1) Emulsion
a) Silver halide crystals
b) Bromine
c) Iodine
b. Effects of milliamperes and kilovolts on film
c. Latent image formation
1) Photoelectrons
2) Reduction to metallic silver
d. Purpose of silver bromide crystals
e. Film artifacts
3. Grids
a. Construction of grids
b. Ratio factors in grid section
1) Computation of grid ratio
2) Computing grid conversion factors
c. Application of grids
d. Types of grids
4. Collimator and cones
a. Construction and purpose
b. Calculation of field coverage from cones
c. Effects on film contrast
d. Types of apertures

5. Filters
a. Inherent in the x-ray tube
b. External filtration
c. Effects on the quality of the x-ray beam
c. Patient protection
6. Calipers and identification markers
a. Measuring devices
b. Film identification markers
D. Define radiographic equipment terminology
1. Definition of terms:
a. Roentgen
b. Rem
c. Rad
d. Maximum permissible dose
2. Unit conversion
3. Computation of patient dose
4. Patient and personnel protection
a. Inverse square law
1) Computation of radiation intensity
b. Lead aprons and gloves
c. Dosimeter (film badges)
d. Collimators
e. Cones
E. Describe the operation and utilization of wet and dry processing
1. Darkroom construction
a. Equipment
1) Processor
2) Chemical holding tanks
3) Film identification cameras/flashers
4) Safe lights
5) Silver recovery units
6) Handling and storage of film
2. Processor
a. Processing
1) Automatic
2) Manual
3) Acid and base solutions
b. Transportation and circulation system
1) Film transport system
2) Chemical circulation
c. Artifacts
1) Film
2) Chemical
3) Temperature
d. Chemicals function
F. Evaluate the differences in characteristics that are inherent in a film-based system and a cassette and cassette-less digital system
1. Advantages of film-based over digital-based imaging
a. Spatial resolution
b. Security of storage
2. Advantages of digital-based imaging systems over film-based systems
a. Increased exposure latitude
b. Increased dynamic range
c. Improved structure visualization
d. Ability to electronically store and transmit images
e. Increased workflow and productivity
G. Describe the method of image acquisition in a cassette and cassette-less digital system
1. Computed radiography
a. Layers of the imaging plate
b. Chemical composition of the PSP screen
c. Stages of photostimulable phosphor layer production
2. Direct digital radiography
a. Flat panel detector components
b. Direct and indirect conversion
H. Distinguish and evaluate CR-based and DR-based image artifacts
1. Classification of CR and DR artifacts
a. Handling/storage artifacts
b. Exposure artifacts
c. Processing artifacts

Lab Content

Not applicable.

Special Facilities and/or Equipment

A. Multimedia classroom
B. Classroom with viewboxes
C. QC evaluation equipment for visual aids and practical use

Method(s) of Evaluation

A. Quizzes
B. Midterms
C. Final examination

Method(s) of Instruction

May include, but not limited to: lecture, discussion, cooperative learning exercises, and demonstration.

Representative Text(s) and Other Materials

Bushong, Stewart. Radiologic Science for Technologists. 10th ed. St. Louis, MO: C.V. Mosby, 2012. ISBN 978-0323081351

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

Weekly reading assignments from text.

Discipline(s)

Radiological Technology