RADT A290: APPLIED PHYSICS & QUALITY CONTROL

Item	Value
Curriculum Committee Approval Date	12/08/2021
Top Code	122500 - Radiologic Technology
Units	1 Total Units
Hours	36 Total Hours (Lecture Hours 9; Lab Hours 27)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

Applied principles of physics for current radiographic equipment including image viewing and recording systems, and tomography. Understanding of the process and concepts of quality control as it relates to radiologic technology. Review of imaging concepts (analog and digital), x-ray beam quantity and quality, and radiation protection. COREQUISITE: RADT A277. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Identify the methodologies for reducing exposure to patients, staff, and self during fluoroscopic procedures
2. Describe the quality control procedures to maintain California State mandated requirements of fluoroscopic equipment.
3. Describe the various x-ray photon tissue interactions and their affect on image quality and patient dose.

Course Objectives

- 1. Identify current design, standards, and function of the x-ray tube and generator.*
- 2. Differentiate between low-high voltage systems and two, six, and twelve pulse generators.**
- 3. List quality control procedures to maintain imaging equipment.*
- 4. Identify the major principles of radiation protection.*
- 5. Identify x-ray beam quality, quantity, and patient dose.*
- 6. Identify principles of x-ray beam behavior and the effect on the radiographic image.*
- I * Competencies
- II ** Foundation Skills
- II. 1. Review the various quality control activities required to assure equipment is performing to specification.

Lecture Content

X-ray beam quantity and quality Quality of x-rays Heterogeneous nature/x-ray spectra Half-value layer Interactions of ionizing radiation and matter Attenuation and absorption Scattered and secondary radiation Interactions Photoelectric Coherent Compton Annihilation radiation X-ray Generators Review electromagnetic phenomena Induction Induced electric current/self-induction Electric generators and motors Operating principles AC vs. DC Two, six, and twelve pulse generators Production and control of high voltage Transformers and auto transformers Efficiency and power losses Rectification and diode construction Autotransformers X-ray tube construction and operation Radiographic tubes Construction and photon production Factors governing tube life Circuits X-ray beam formation Sources tube/radioactive nuclides Conditions necessary Electr on interactions and efficiency factors Brems radiation Characteristic radiation Exposure (quantity) Measurement and rate Measuring devices Radiographic tube rating charts Anode thermal capacity Instantaneous tube rating charts Anode cooling curve Radiographic timing systems Electronic timer Milliamp ere/second (mAs) meter Automatic exposure control Back-up timer Body section radiography Principles of tomography Types of tube movement Terminology Comparison of body section modalities CT MRI US

Lab Content

Labs will consist of various quality control tests that allow students to develop an understanding of the effects changes to hardware, technical factors, and patient types have on equipment performance and image quality.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

1. Theory a. lecture b. reading assignments 2. Demonstration a. review of the different devices used for QC in the radiology department. b. collaborative learning techniques 3. Laboratory experiment participation/evaluation

Reading Assignments

1. Some examination and quizzes contain essay format questions.2. Homework assignments will require both written and verbal responses.3. Lab experiment summations. 1hr. /wk

Writing Assignments

1. Some examination and quizzes contain essay format questions.2. Homework assignments will require both written and verbal responses.3. Lab experiment summations. 30 minutes wk

Out-of-class Assignments

1. Some examination and quizzes contain essay format questions.2. Homework assignments will require both written and verbal responses.3. Lab experiment summations. 30 minutes/wk

Demonstration of Critical Thinking

1. Periodic quizzes2. Tests (written components)3. Performance of lab experiments4. Final exam comprehensive

Required Writing, Problem Solving, Skills Demonstration

1. Some examination and quizzes contain essay format questions. 2. Homework assignments will require both written and verbal responses.
3. Lab experiment summations.

Eligible Disciplines

Radiological technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Radiological technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Bushong, S. C. . Radiologic Science for Technologists, 11th ed. Elsevier/Mosby, 2017 Rationale: - 2. Required Curry, Thomas. . Christensens Physics of Diagnostic Radiology,, ed. Lea Febiger,, 1990 Rationale: - 3. Required Carroll, Q. B. . Radiography in the Digital Age, 3rd ed. Thomas, 2018

Other Resources

1. State Syllabus – syllabus on Fluoroscopy Radiation Protection. Department of Health Services, Radiologic Health Branch State of California.