RADT A105: RADIATION AND IMAGING SAFETY

Item	Value
Curriculum Committee Approval Date	12/02/2020
Top Code	122500 - Radiologic Technology
Units	1 Total Units
Hours	27 Total Hours (Lecture Hours 13.5; Lab Hours 13.5)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)

Course Description

A study of the effects of radiation in humans and the principles of protection as applied to radiography. Introduction to health-physics instrumentation with a study of radiation control regulations. PREREQUISITE: Acceptance into the OCC Radiologic Technology Program (Cohort Restriction). Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Explain the basic concepts of radiation safety and apply them in the laboratory and clinical setting.
2. Students will be able to identify contraindications for MR.

Course Objectives

- 1. Explain the biological effects of radiation of humans
- 2. Identify the major methods of reducing patient and operator exposure to ionizing radiation
- 3. Identify the maximum permissible doses for operators of equipment
- 4. Identify health physics instruments and for which purpose each is intended
- 5. Identify the California laws governing radiographers and operation of X-ray equipment
- 6. Practice the principles of radiation protection techniques on radiographic phantoms.
- 7. Perform laboratory experiments to demonstrate the basic fundamentals of radiation protection including time, distance and shielding.
- 8. Identify the radiation shielding structural regulations and requirements
- 9. Identify the associated risks for patients and technologists in the MRI environment.
- I SCAN SKILLS IDENTIFICATION
- I. 1. Competencies
- I. 2. Foundation Skills

Lecture Content

A. Introduction and orientation to the course and the facilities. 1. Introduction to the lab a. X-ray room B. Roentgen rays, interaction of x-rays with humans 1. Ionizing radiation and matter a. Energy levels b. Types of interactions c. Importance d. Detection 2. Radiation dosimetry a. Roentgen b. RAD c. REM C. Radiation protection/interactions 1. Justification for X-ray procedures a. Responsibility b. Biological damage potential c. Medical radiation exposure 2. Probability of photon interactions a. Attenuation b. 4 processes D. Radiation quantities, units and limits. 1. Historical evolution of quantity units a. Exposure b. Absorbed dose c. Equivalent 2. Traditional and SI units/conversion factors 3. Limits for exposure a. Regulatory agencies b. Legal dose limits c. ALARA concept d. Protection philosophy E. Biological effects and basic cell biology. ; 1. Basic cell components 2. Radiation biology a. Ionization b. Linear energy transfer c. Relative biological effectiveness d. Molecular, cellular effects e. Radio sensitivity F. Basic principles of protection for patient and operator. 1. Effective communication a. Immobilization b. Beam collimation c. Filtration d. Shielding e. Exposure factors/processing 2. Occupationally exposed personnel a. Structural shielding/tube housing b. Fluoro procedures/equipment c. Mobile exams d. Distance - inverse square law G. California State Department Syllabus on Radiography 1. Radiography utilization a. Statistical overview b. Calif code or regulations (title 17) 2. Factors influencing patient dose H. State Syllabus Radiation protection cont. 1. Factors influencing patient dose cont. a. Tube and equipment b. Half valve layer c. Phototiming d. Source-to-image-receptor distance 2. Patient and patient positioning a. Human anatomical considerations b. Motion I. State syllabus cont. repeat films (retakes) 1. Equipment and accessory failure or error a. Supervisor responsibilities b. Repeat studies 2. X-ray personnel error a. How to minimize b. Retake analysis J. Radiation protection considerations in areas outside of routine departmental procedures 1. Pediatric radiography a. Shielding b. Artifacts/motion 2. Computed tomography a. Operation principles b. Collimation/protection 3. Mobile radiographic equipment a. Structural provisions' b. Shielding/protection K. Health effects of low-level radiation dose 1. Somatic dose indicators a. Bone marrow b. Thyroid and skin 2. Genetic dose indicators/GSD 3. Radiobiological injury a. Cellular amplification b. Latent period 4. Determinants of biological effect a. Dose-effect curve b. Carcinogenic c. Cataractogenic L. Personnel monitoring 1. Monitoring devices a. Film badge p; b. TLD c. pocket ionizing chamber 2. Occupational exposure a. Maximum permissible dose b. Definitions/ over exposure M. MR Safety 1. Patient Contraindications 2. MR suite considerations

Lab Content

A. Factors influencing patient dose cont. 1. Tube and equipment 2. Half valve layer 3. Phototiming 4. Source-to-image-receptor distance B. Patient and patient positioning 1. Human anatomical considerations 2. Motion C. Equipment and accessory failure or error 1. Supervisor responsibilities 2. Repeat studies D. X-ray personnel error 1. How to minimize 2. Retake analysis E. Radiation protection considerations in areas outside of routine departmental procedures F. Pediatric radiography 1. Shielding 2. Artifacts/motion G. Computed tomography 1. Operation principles 2. Collimation/protection H. Mobile radiographic equipment 1. Structural provisions' 2. Shielding/protection

Method(s) of Instruction

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

Instructional Techniques

Lecture and application of ideas Individual and small group laboratory exercises Video and laboratory demonstration

Reading Assignments

Students will spend approximately 3 hours per week on reading from assigned text and materials.

Writing Assignments

Students will spend approximately 1 hour per week on writing assignments, including: 1. Some short essay questions in examination or quiz format 2. Laboratory individual or group projection summations

Out-of-class Assignments

Students will have 2 - 4 hours of outside activites to complete per week.

Demonstration of Critical Thinking

Periodic quizzes Written examinations Laboratory assignments requiring written summation of projects Attendance and participation in lab and lecture

Required Writing, Problem Solving, Skills Demonstration

Some short essay questions in examination or quiz format Laboratory individual or group projection summations

Eligible Disciplines

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

Textbooks Resources

1. Required Statkiewicz, Mary. Radiation Protection in Medical Radiography, ed. St. Louis: Mosby, 2014 2. Required State syllabus . Syllabus on Fluoroscopy Radiation Protection, ed. Department of Public Health, Radiologic Health Branch State of California, 0 Rationale: . 3. Required Bushong, S.. Radiologic Science for Technologists, latest ed. St. Louis: Elsevier/Mosby, 2015

Other Resources

1. Computer Instructional Programs