Course Information Form (CIF)

Course Code: XRA 214

Course Title: Advanced Radiologic Technology I

Department: Allied Health
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 51.0907
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 2-2-3
Credit Hour Distribution:

Lecture: 2	Lab: 2	Clinical: 0	**Total: 3**

General Course Information

Catalog Description

Advanced factors affecting radiographic exposure. Radiobiology, interactions in matter, health physics, and radiation protection.

General Course Objectives

Radiobiology, interactions with matter, early and late effects of radiation, radiation dose, health physics, and radiation protection.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 099	Placement out of CCS 099	Placement out of MAT 072

Prerequisites

Credit in XRA 112, XRA 231, BIO 122, and PHY 112
Concurrent enrollment in XCT 210, XRA 213, and XRA 232
Admission into the Radiologic Technology program

Methods of Evaluation

3-5 objective exams, 2-4 laboratory practicals, and 12-14 lab scenario write-up exercises.

Instructional Materials and Additional Supplies

Radiologic Science for Technologists, current ed., Bushong, S. Elsevier.
Principles of Radiographic Imaging, current ed., Carlton, R., Adler, A. Delmar. Cengage Learning.

Course Content

General Learning Outcomes (GLOs)

- Communication: Students will demonstrate the ability to read, write, listen, and speak effectively.
- Creativity and Innovative Thinking: Students will design, present, and interpret materials, information, and ideas in innovative ways.
- Technology: Students will demonstrate the ability to evaluate, select, and appropriately use current and emerging tools.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Essential Characteristics of Imaging: a. density, b. contrast, c. definition, d. distortion	1. Determine and identify density/brightness. 2. Manipulate the controlling factor of density/brightness. 3. Determine and assess how to use kV as a factor to control image receptor exposure. 4. Determine and assess contrast. 5. Determine and manipulate the factors that control contrast. 6. Determine and assess how fog influences contrast. 7. Articulate factors affecting geometric sharpness and describe how these factors affect geometric sharpness. 8. Determine and measure distortion. 9. Determine and measure magnification distortion. 10. Articulate and assess the controlling factors of magnification. 11. Determine the percentage of magnification given OFD and FFD using formula. 12. Determine and assess true distortion. 13. Demonstrate the rule for minimizing true distortion.	7	14	0
Factors Influencing Choice of Exposure Factors	1. Determine, compare, and contrast the different body types, including different body types on an image. 2. Determine and assess the different skull types. 3. Determine the different types of densities, in order, from most to least dense or vice versa. 4. Determine and demonstrate the use of calipers. 5. Determine and assess the frequency of motion in various body parts. 6. Administer a proper exposure time for various ages. 7. Determine and assess whether a given pathology is hard or easy to penetrate, and consider how to change techniques for a given pathology.	4	10	0
Types of Technique Charts	1. Determine and assess the differences between the two types of techniques, including variable and fixed kV. 2. Determine and assess how to set up each kind of technique chart. 3. Determine and assess the terms used in tomography. 4. Determine and assess the major components of a tomographic unit. 5. Determine and assess the basic principles of stereography. 6. Compute and establish the direction and amount of tube shift, given the FFD. 7. Determine and assess uses for stereoradiography.	2	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Radiation Dose and Dosimetry	1. Identify and assess radiation dose. 2. Determine and assess dose rate. 3. Determine and assess C/kg. 4. Determine and assess Gray. 5. Determine and assess Sievert. 6. Determine and assess RBE. 7. Determine and assess LET. 8. Identify and assess the mechanisms of operation of various types of dosimeters. 9. Identify and assess the qualities of an ideal dosimeter.	2	3	0
Introduction to Radiobiology	1. Describe and explain radiobiology. 2. Summarize and classify ionizing and non-ionizing radiation. 3. Describe and explain the role of radiobiology. 4. Review and summarize the history of radiobiology.	2	0	0
Chronic Exposure	1. Predict and summarize the internal and external sources of chronic exposures. 2. Describe and explain MPD. 3. Describe and explain how MPD is calculated. 4. Describe and explain MPB. 5. Restate the differences between physical and biological half-life. 6. Describe and explain the therapeutic uses of radionuclides. 7. Describe and explain the diagnostic uses of radionuclides.	2	0	0
Effects of Radiation on Molecules	1. Describe and explain the parts of a cell. 2. Describe and explain how radiation energy is lost. 3. Describe and explain the stages of action of ionizing radiation. 4. Describe some macromolecules. 5. Explain the types of alterations. 6. Restate why DNA is so important. 7. Sketch a simple diagram.	2	0	0
Effect of Radiation at Cellular Level	1. Restate the Law of Bergonie and Tribondeau. 2. Give examples of the Law of Bergonie and Tribondeau. 3. Discuss the genetic implications of chromosomal aberrations. 4. Restate what happens when the following are radiated: plasma membranes, enzymes, and mitochondria. 5. Discuss what may happen to the cell depending on the phase of cell division.	2	0	0
Radiation Genetics and Embryology	1. Review genetic versus somatic mutations. 2. Trace stages of spermatogenesis and oogenesis. 3. Explain the different stages of human embryologic development. 4. Discuss the implications of radiating of females who might be pregnant.	2	0	0
Radiation Accidents and Acute Radiation Syndrome	1. Restate why it is difficult to determine how much radiation is received in an accident. 2. Restate two methods of determining exposure. 3. Restate the effect of acute radiation on the following systems: a) hemopoietic and blood, b) GI, c) vascular, d) skin, e) immune. 4. Discuss the implications of radiation on immune responses. 5. Classify measures used to treat acute radiation syndrome.	2	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Modification of Radiation Response	1. Restate the oxygen effect. 2. Classify applications of the oxygen effect. 3. Classify specific chemicals and their mechanisms. 4. Classify other factors which affect radiation response. 5. Restate how the other factors affect radiation response. 6. Classify the most common tumors. 7. Explain the source of radiation known to have caused carcinomas. 8. Discuss the effect of radiation on life span. 9. Give examples of the effect of radiation on lifespan. 10. Restate how much radiation it takes to produce sterility. 11. Restate how radiation affects the possibility of cataracts.	3	0	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
30	30	0