PARKLAND COLLEGE

Course Information Form (CIF)

Course Code: XRA 213

Course Title: Radiographer's Physics

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

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-0-3
Credit Hour Distribution:

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

General Course Information

Catalog Description

Basic x-ray equipment construction and function, properties of electromagnetic radiation, and basic x-ray physics.

General Course Objectives

X-ray rectification, production, and properties of x-rays, x-ray tubes, and circuits; nature of radiation, radioactivity, properties of ionizing radiation and interactions with matter, radiation detection, and dosimetry.

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 214, and XRA 232
Admission into the Radiologic Technology program

Methods of Evaluation

2-4 objective exams, 4-5 objective quizzes, and 6-8 written assignments.

Instructional Materials and Additional Supplies

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

Course Content

General Learning Outcomes (GLOs)

- 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
Rectification: a. principles of thermionic emission, b. principles of thermionic diodes, c. types of rectification, d. types of rectifying devices	1. Describe thermionic emission. 2. Explain the principle of thermionic emission. 3. Summarize examples of thermionic diodes. 4. Describe current flow in thermionic diodes. 5. Classify methods of rectifying an AC current. 6. Describe the various forms of rectification. 7. Describe heat load capacity. 8. Describe the advantage of valve tube vs. solid state rectifiers.	6	0	0
X-ray Tubes	1. Classify the basic components of x-ray tubes. 2. Describe line focus principle. 3. Describe actual vs. effective focus. 4. Discuss advantages and disadvantages of various types of tubes. 5. Interpret differences between x-ray and therapy tubes. 6. Generalize types of tube cooling. 7. Classify major components for tube housings. 8. Describe saturation vs. effective tube voltage. 9. Classify various focal spot sizes. 10. Review and interpret tube rating charts and anode cooling charts.	6	0	0
X-ray Circuits and Equipment	1. Classify components of the primary and secondary circuits. 2. Discuss single phase vs. full wave circuits. 3. Describe and interpret major differences between three-phase and full equipment. 4. Summarize advantages of capacity discharge units. 5. Describe the importance of generator capacity and rating with x-ray tube rating.	6	0	0
Review of Fundamental Physics: a. atomic structure, b. nuclides and radionuclides, c. nature of electromagnetic radiation	1. Classify the mass and charge of the particle in an atom. 2. Review the orbital shells in an atom. 3. Describe nuclides and radionuclides. 4. Interpret the nature of electromagnetic radiation.	6	0	0
Radioactivity and X-rays	1. Conclude generally how x-rays are produced. 2. Describe specifically how characteristic x-rays are produced. 3. Discuss how Brems x-rays are produced. 4. Describe attenuation. 5. Describe half-value layer. 6. Describe radioactivity. 7. Describe the following methods of radioactivity decay: 1) alpha emission, 2) beta-minus emission, 3) beta-plus emission, 4) electron capture, 5) isometric transition. 8. Describe half-life. 9. Describe curie.	6	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Properties of Radiation and Interaction with Matter	1. Interpret the mass and charge of an alpha particle. 2. Report the origin of an alpha particle. 3. Discuss the energy, range, and velocity of an alpha particle. 4. Explain how an alpha particle interacts with matter. 5. Report the origin of a beta-plus and beta-minus particle. 6. Discuss a beta spectrum, including beta emax. 7. Give examples of ways beta particles interact with matter. 8. Generalize the specific ionization of beta particles to that of alpha material. 9. Report the origin of gamma rays. 10. Give examples of ways gamma rays interact with matter. 11. Restate the effect of altitude on intensity of cosmic radiation. 12. Restate the effect of latitude on intensity of cosmic radiation. 13. Restate the effect of barometric pressure on intensity of cosmic radiation.	6	0	0
Radiation Detection and Measurement	1. Discuss the radiation detector. 2. Generalize the two types of detection systems. 3. Restate the principles behind each of the three kinds of intensity detection systems. 4. Give at least one example of each kind of intensity detection system. 5. Describe several factors which affect relative activity.	3	0	0
Image Intensified Fluoroscopy	1. Describe image intensified fluoroscopy. 2. Illustrate the following components of an image intensifier: 1) input phosphor, 2) photo cathode, 3) electron lens, 4) accelerating anode, 5) output phosphor. 3. Explain the function of an image intensifier. 4. Discuss gain and conversion factors as related to intensification including: 1) gain, 2) brightness, 3) conversion factor, 4) automatic brightness control, 5) resolution, 6) distortion, 7) quantum mottle, 8) noise, 9) magnification, 10) minification, 11) dose. 5. Describe the optical system of an image intensifier including: 1) optical viewing, 2) video camera/recorder, 3) spot film. 6. Discuss image formation in terms of image size, framing, and brightness. 7. Discuss applications of image intensified fluoroscopy and brightness, including operating/technique.	3	0	0
Recording Media and Techniques	1. Discuss the purpose, construction, and application of video tubes. 2. Describe the purpose, construction, and application of video recorders. 3. Discuss the purpose, construction, and application of cine radiographic equipment and processor. 4. Describe the purpose, construction, and application of strip cut film cameras. 5. Describe the purpose, equipment/film, and procedures of duplication and subtraction. 6. Discuss the purpose and procedure of radiographic magnification.	3	0	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	0	0