

Montgomery County Community College
 RAD 105
 Radiation Physics
 3-3-0

COURSE DESCRIPTION:

This course is designed to establish a basic knowledge of atomic structure and terminology. The nature and characteristic of radiation, x-ray production and the fundamentals of photon interactions with matter are included. Students will establish a knowledge base in radiographic, fluoroscopic, mobile, and tomographic requirements and design. Basic quality control will also be discussed.

REQUISITES:*Previous Course Requirements*

- RAD 100 Introduction to Radiography and Patient Care
- RAD 102 Radiographic Exposure and Technique
- RAD 104 Clinical Education I
- RAD 111 Radiographic Procedures I

Previous or Concurrent Course Requirements

- RAD 113 Principles of Digital Imaging
- RAD 121 Radiographic Procedures II
- RAD 114 Clinical Education II

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Differentiate between ionizing and nonionizing radiation.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Videotapes/DVD's	Exam Questions Class Discussion
2. Describe the electromagnetic spectrum and the x-ray emission spectra.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Videotapes/DVD's	Exam Questions Class Discussion

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
3. Define and describe wavelength and frequency and how they are related to velocity.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Videotapes/DVD's	Exam Questions Class Discussion
4. Explain the relationship of energy, wavelength and frequency.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Videotapes/DVD's	Exam Questions Class Discussion
5. Identify the properties of x-rays and principles of x-ray production.	Lecture/Discussion Demonstration/Practice Case Study Student Presentation Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion
6. Discuss various photon interactions with matter in terms of description of the interaction, relation to atomic number, photon energy and part density, and their applications in diagnostic radiology.	Lecture/Discussion Demonstration/Practice Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion Group Projects
7. Discuss the relationships of wavelength and frequency to beam characteristics.	Lecture/Discussion Demonstration/Practice Case Study Student Presentation Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion Group Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
8. Compare and contrast generators in terms of radiation production and efficiency and units of radiation detection and measurement.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion
9. Explain image-intensified and digital fluoroscopy.	Lecture/Discussion Demonstration/Practice Student Presentation Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion
10. Discuss the proper test equipment/procedures for evaluating the operation of an x-ray generator.	Lecture/Discussion Demonstration/Practice Case Study Student Presentation Exam questions Class discussion Computer Technology Assigned Readings Quality Control Experiments Videotapes/DVD's	Exam Questions Class Discussion Quality Control Labs
11. Evaluate the benefits of a quality management program to the patient and to the department.	Lecture/Discussion Demonstration/Practice Case Study Student Presentation Computer Technology Assigned Readings Quality Control Experiments	Exam Questions Class Discussion Quality Control Labs Group Projects
12. List elements of a quality management program and summarize how each is related to the quality management program.	Lecture/Discussion Demonstration/Practice Case Study Student Presentation Computer Technology Assigned Readings Quality Control Experiments	Exam Questions Class Discussion Quality Control Labs

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria.*

SEQUENCE OF TOPICS:

1. Structure of the Atom
2. Nature of Radiation
3. X-ray Production
4. Interaction of Photons with Matter
5. X-Ray Circuit
6. Radiographic Equipment
7. Diagnostic X-ray Tubes
8. Image Intensified and Digital Fluoroscopy
9. Conventional Tomography
10. Magnification Radiography
11. Quality Control
12. Units of radiation exposure and detection

LEARNING MATERIALS:

Texts:

Carroll, Quinn, B. (2018). *Radiography in the Digital Age* (3rd Edition). Springfield, IL: Charles C. Thomas Publisher
 Carroll, Quinn, B. (2018). *Student Workbook for Radiography in the Digital Age* (3rd Edition). Springfield, IL: Charles C. Thomas Publisher

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:

Prepared by: Debra Poelhuis, R.T., M.S.	Date: 5/2004
Revised by: Debra Poelhuis, R.T., M.S.	Date: 1/2009
VPAA/Provost Compliance Verification: Dr. John C. Flynn, Jr.	Date: 9/11/2009
Revised by: Debra Poelhuis, R.T., M.S.	Date: 10/26/2012
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 10/26/2012
Revised by: Cheryl L. DiLanzo, M.S., R.T.	Date: 10/28/2016
VPAA/Provost or designee Compliance Verification:	Date: 11/5/2016



This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.