Virginia Western Community College
RAD 112
Radiographic Science II

Prerequisites
Successful completion of RAD 111.

Course Description
Teaches concepts of radiation, radiography physics, and fundamentals of electromagnetic radiation, electricity and magnetism, and application of these principles to radiography. Focuses on x-ray production, emission, and x-ray interaction with matter. Develops skills in analysis, quantification and synthesis, and applies problem-solving skills.

Semester Credits: 4 **Lecture Hours: 3** **Lab/Clinical/Internship Hours: 3**

Required Materials

Textbook:
Essentials of Radiologic Science. Robert Fosbinder & Diane Orth, 2012. ISBN: 078177554X

Essentials of Radiologic Science Manual/Workbook. Robert Fosbinder & Diane Orth 2012. ISBN: 0781775566

Supplementary Materials:
Several resource textbooks are located in the Radiography Lab

Course Outcomes
At the completion of this course, the student should be able to:

- Understand the major concepts of radiation and radiography physics.
- Understand the fundamentals of electromagnetic radiation, electricity and magnetism.
- Apply fundamental principles of electromagnetic radiation, electricity and magnetism production to clinical situations.
- Understand x-ray production, emission and interactions with matter.

Topical Description

Chapter 8: Intensifying Screens

- Intensifying Screens
- Intensifying Screen Construction
- Phosphor Materials
- Spectral Matching
- Rare Earth Screens
- Screen Speed
- Radiographic Noise and Quantum Mottle
- Spatial Resolution
- Film/Screen Cassettes

Chapter 9: Film and Processing

- Film Construction
- Sensitometry and Densitometry
- Characteristic Curve
- Specialty Types of Film
- Film Storage and Handling
- Automatic Film Processing
- Film Transport System
- The Darkroom
- Silver Recovery
- Daylight Processing Systems
- Dry Processing Film

Chapter 13: Fluoroscopy, Conventional and Digital

- Historical Perspective
- Eye Physiology
- Fluoroscopy
- Image Intensifier Components
- Brightness Gain
- Image Quality
- Fluoroscopic Displays
- Archiving the Fluoroscopic Image
- Mobile C-Arm Fluoroscopy
- Patient Dose

Chapter 14: Digital Imaging

- Digital Image Acquisition
- Data Characteristics
- Digital Imaging Systems

Chapter 19: Radiation Biology

- Human Biology
- Cell Proliferation
- Tissues and Organs
- Cell Survival Curve
- High-Dose Radiation Effects
- Whole Body Radiation Exposures
- Effects of Partial Body Irradiations
- Late Somatic Effects
- Radiation and Pregnancy
- Genetic Effects

Chapter 20: Radiation Protection and Regulations

- Equipment Regulations
- Room Shielding
- Radiation Detectors
- Monitoring Period

Chapter 21: Minimizing Patient Exposure and Personnel Exposure

- Reducing Exposure to Ionizing Radiation
- Reduction of Radiation Exposure
- to Staff
- Reduction of Radiation Dose to the Patient
- Reducing Exposure During Pregnancy

Chapter 15: Quality Control

- Radiographic Quality control
- Automatic Exposure Control
- Tomography Quality Control
- Processor Quality Control
- Computed Radiography Quality Control
- Fluoroscopy Quality Control
- Protective Apparel Quality Control

Specific Course Outcomes per Chapter

At the completion of Chapter 8, the student should be able to:

- Describe the purpose and construction of intensifying screens.
- Describe the characteristics of intensifying earth screens
- Identify the factors that affect screen speed and spatial resolution
- Explain the construction of cassettes and how to care for cassettes
- Describe luminescence, fluorescence, and phosphorescence

At the completion of Chapter 9, the student should be able to:

- Discuss the components of radiographic film
- Identify the stages of image formation
- List and describe the important portions of the characteristic curve
- Identify the optical density, speed, contrast, and latitude of radiographic film
- Identify the stages of film processing
- List the components of automatic film processing

At the completion of Chapter 13, the student should be able to:

- Identify the components of a fluoroscopy system.
- Identify the components of an image intensifier.
- Describe the purpose of an automatic brightness control circuit.
- Identify the factors that influence patient dose during fluoroscopy.
- Explain the effects of flux and minification gain on total brightness gain.
- Discuss the factors that affect fluoroscopic image contrast, resolution, distortion, and quantum mottle.

At the completion of Chapter 14, the student should be able to:

- Describe how a matrix of pixels is used to form a digital image.
- Identify the relation between matrix size, pixel size, and field of view.
- Identify the components of a digital imaging system.
- Describe the operation of a computed radiography system.
- Explain the elements used in a digital radiography system.

At the completion of Chapter 19, the student should be able to:

- Describe the reproductive cycle of the human cell.
- Identify the relative radiation sensitivity of human cells, tissues, and organs.
- Describe the dose-response models.
- Identify the stages of acute radiation effects.
- Discuss target theory of radiobiology.
- Relate the Law of Bergonie and Tribondeau.
- List and discuss the biologic factors that affect the degree of tissue damage in relation to radiation exposure.

At the completion of Chapter 20, the student should be able to:

- State the requirements for personnel monitoring.
- Describe the construction of protective barriers and identify factors that determine the thickness of lead in the barriers.
- Identify devices used to detect and measure radiation.
- State the requirements for construction of radiographic equipment.
- Describe safety requirements of mobile and fluoroscopic equipment.

At the completion of Chapter 21, the student should be able to:

- Describe the methods of reducing radiation exposure.
- Describe ALARA.
- State the three methods of radiation reduction to staff.
- Name the dose limits for occupational and nonoccupational workers.
- Discuss the radiosensitivity of pregnancy.

At the completion of Chapter 15, the student should be able to:

- State the factors included in radiographic quality control (QC).
- State the factors included in processor QC.
- State the types and sources of film artifacts.
- State the factors included in fluoroscopic QC.

Note to Instructors

1. Students will continue to identify and set proper radiographic technique in the clinical setting.
2. Students will discuss technical factors and image quality into their procedure competency reviews.
3. Students will apply radiation protection practices while in the clinical setting.