

# Common Course Outline

RADT 112

Radiography II

6 credits

## The Community College of Baltimore County

### Description

Three (3) lecture hours, seventeen (17) laboratory hours, fifteen weeks. (Offered Spring)

Prerequisite: RADT 121

Radiography II is the fourth course in the sequence of nine courses that comprise the professional portion of the radiography curriculum. The course consists of both classroom and clinical sessions. Classes cover the physical positioning of the patient and equipment to produce routine radiographs of the lower extremity, hip, spine and bony thorax. Principles of radiographic exposure and imaging are also discussed. During the clinical sessions, students continue to participate in actual radiographic procedures by assisting staff at the clinical sites.

### Overall Course Objectives

Upon completion of the Positioning module, the student will be able to:

1. Describe the anatomy of the lower extremity, hip, spine and bony thorax that can be demonstrated on radiographs.
2. Identify anatomy of the lower extremity, hip, spine and bony thorax on diagrams and radiographs.
3. Describe the patient preparation/instructions, patient position, part placement, film selection/ placement, beam alignment angulation, collimation/shielding, and any special considerations for examinations of the lower extremity, hip, spine and bony thorax.

Upon completion of the Radiographic Exposure module, the student will be able to:

1. Identify and define the four components of a quality radiographic image.
2. Identify and analyze the relationships of factors affecting radiographic density, radiographic contrast, recorded detail, and distortion.
3. Explain the purposes of beam limiting devices in terms of patient dosage, scattered radiation production, radiographic density & contrast.
4. Explain the purposes of beam filtration in terms of patient dosage, scattered radiation, radiographic density and contrast.
5. Analyze the relationships of factors affecting both the production of scattered radiation and its effect on the radiographic image.
6. Describe a grid in terms of its purpose, construction, and use.
7. Solve multiple technique problems using formulas and relationships discussed in class.

Upon completion of the Radiographic Imaging module, the student will be able to:

1. Describe the construction and operation of a modern x-ray tube.
2. Determine safe operating limits of x-rays tubes using tube rating charts and anode cooling charts.
3. Compare various types of x-ray generators in terms of advantages, disadvantages, and usefulness.
4. Evaluate the operation of an x-ray generator in terms of kilovoltage accuracy, timer accuracy and mA linearity.
4. Explain the construction, function and proper use of intensifying screens.

**Overall Course Objectives, continued**

6. Discuss the use of intensifying screens in terms of handling, cleaning, testing and evaluation.
7. Describe the purpose, construction, operation and use of an image intensifier.
8. Compare optical systems used in image intensification.
9. Describe the use of video tubes, video recorder, cine cameras, and spot film cameras in recording radiographic images.
10. Discuss the digital imaging process and its use in diagnostic medical imaging.
11. Compare the methods for creating standardized technique systems, and demonstrate technique selection given clinical scenarios.

Upon completion of Clinical Education, the student will be able to:

1. Complete demonstration/practice sessions for category III (lower extremity), and category IV (spine and bony thorax).
2. Complete laboratory evaluations (simulations) for category II (upper extremity), and category III (lower extremity).
3. Present films for image evaluation in category I (chest & abdomen), and category II (upper extremity).
4. Complete a minimum of four successful competency exams in category I (chest & abdomen). These must include: PA & lateral ambulatory chest and flat abdomen (KUB).
5. Complete area-specific performance objectives for scheduled RADT 112 clinical areas.
6. Apply principles of film critique in evaluating radiographic images performed during laboratory and clinical assignments.
7. Perform radiographs on the whole-body patient phantom to include two assigned examinations from category III (lower extremity) and category IV (spine and bony thorax). Identify and label all major anatomical structures on the radiographs.
8. Begin researching a clinical topic for either a scientific essay or exhibit to be completed in Radiography IV (fall semester).
9. Demonstrate appropriate professional behavior while on clinical duty.

**Major Topics**

Positioning module.

- I. Anatomy and Positioning of the following views:
  - A. toes
  - B. foot
  - C. ankle
  - D. heel/calcaneus
  - E. lower leg
  - F. knee
  - G. patella
  - H. femur
  - I. pelvis
  - J. hip, trauma and non-trauma
  - K. cervical spine, trauma and non-trauma
  - K. thoracic spine

**Major Topics, continued**

Positioning module.

Anatomy and Positioning of the following views:

- M. lumbar spine
- N. sacrum
- O. coccyx
- P. sacro-iliac joints
- Q. ribs, anterior and posterior
- R. sternum
- S. sternoclavicular joints

Exposure module.

- I. Qualities of the Radiographic Image
  - A. Visibility vs. Sharpness (Recognizability)
  - B. Photographic Properties
    - a. Density
    - b. Contrast
  - C. Geometric Properties
    - a. Recorded Detail
    - b. Distortion
- II. Photographic Properties: RADIOGRAPHIC DENSITY
  - A. Measurement of Radiographic Density
  - B. Controlling Factors
    - 1. Milliamperage (mA)
    - 2. Exposure Time (Sec.)
    - 3. Milliampere-Seconds (mAs)
    - 4. Reciprocity Law
  - C. Influencing Factors
    - 1. Kilovoltage
    - 2. Source Image Receptor Distance (SID)
    - 3. Focal Spot Size
    - 4. Anode Heel Effect
    - 5. Filtration
    - 6. Collimation (Field Size & Beam Restriction)
    - 7. Orthopedic Casts
    - 8. Patient Factors
    - 9. Film/Screen Combinations
    - 10. Grids
- III. Photographic Properties: Radiographic Contrast
  - A. Film Contrast
  - B. Subject Contrast
  - C. Scale of Contrast
    - 1. Long Gray Scale (Low Contrast)
    - 2. Short Gray Scale (High Contrast)

**Major Topics, continued**

- D. Controlling Factor
  - 1. Kilovoltage
- E. Influencing Factors
  - 1. kVp-mAs Relationship
- F. Influencing Factors
  - 1. Patient Factors
  - 2. Control of Scatter/Secondary Radiation
  - 3. Film/Screen Combinations
  - 4. Filtration
  - 5. Air-Gap Technique
- IV. Geometric Properties: Recorded Detail
  - A. Definitions
    - 1. Resolution
    - 2. Penumbra/Umbra
  - B. Motion Unsharpness
    - 1. Voluntary and Involuntary
    - 2. Control of Motion
  - C. Materials Unsharpness
    - 1. Film and Intensifying Screens
    - 2. Film/Screen Contact
    - 3. Quantum Mottle
    - 4. Modulation Transfer Function
  - D. Geometric Unsharpness/Blur
    - 1. Object-Image Receptor Distance (OID)
    - 2. Source-Image Receptor Distance (SID)
    - 3. Focal Spot Size
    - 4. Geometric Unsharpness Formula
- V. Geometric Properties: Distortion
  - A. Magnification (Size Distortion)
    - 1. Source-Image Receptor Distance (SID)
    - 2. Object-Image Receptor Distance (OID)
    - 3. SID/SOD Ratio
  - B. Shape Distortion
    - 1. Object Size and Shape
    - 2. Tube-Part-Film Alignment
    - 3. Angulation of Central Ray
- VII. Solving Multiple Technique Problems

**Radiographic Imaging module.**

- I. Heat Loading of X-ray Tubes
  - A. Factors affecting heat loading
  - B. Heating and cooling charts

**Major Topics, continued**

- II. Calibration of X-ray Generators
  - A. Types of Generators
  - B. Testing Equipment
- III. Beam Restricting Devices
  - A. Purpose of beam restriction
  - B. Types of primary beam restrictors
- IV. Cassettes and Screens
  - A. Purpose and construction of cassettes
  - B. Purpose and construction of screens
    - 1. Screen speed
    - 2. Quality control
- V. Fluoroscopic Imaging
  - A. Image intensification
  - B. Recording media and techniques
  - C. Digital fluoroscopy
- VI. Film/Radiograph Identification
  - A. Legalities
  - B. Equipment
- VII. Digital X-ray Imaging
  - A. Review of computer principles and terminology
  - B. Equipment specifications for imaging
  - C. Applications in imaging
- VIII. Formulating Technique Guides
  - A. Fixed (optimum) kilovoltage technique guide
  - B. Variable kilovoltage technique guide
  - C. High kilovoltage technique guide
  - D. AEC technique guide
- IX. The Patient Problem
  - A. Body habitus
  - B. Additive and destructive pathology
  - C. Patient motion and image quality
  - D. Tissue thickness and type

**Course Requirements**

Grades for RADT 112 will be determined by the following:

- I. Attendance, Dress Code, & Ethics 2.5 points
  - 0.5 point for each absence or late -1.0 point for a "NO-CALL"
  - Absence from three (3) or more classes or three (3) or more absences from clinical will lower the course grade one letter unless accompanied by a physician's written note
  - 0.5 for each infraction of uniform policy -1.0 for each infraction after 1st notice
  - Students must be appropriately attired to be permitted in the clinical areas.
  
- II. Clinical Performance Objectives, Exam Logs 5 points

**Course Requirements, continued**

|        |  |                                |
|--------|--|--------------------------------|
| III.   | Clinical Evaluations<br>Evaluations of students' clinical performance are completed weekly by supervising clinical staff.          | 7.5 points                     |
| IV.    | Laboratory Evaluations (Simulations), Image Evaluations, Competency Examinations   | 7.5 points                     |
| V.     | Film Critique<br>Students are responsible for preparing & presenting a film critique report  | 5 points                       |
| VI.    | Essay/Exhibit Update<br>Students must submit written progress reports documenting their research for the scientific exhibit/essay. | 2.5 points                     |
| *VII.  | Quizzes, Experiments, & Units  | 10 points                      |
| *VIII. | Written Tests(completed at the end of each module)   | 25 points                      |
| *IX.   | Final Written Comprehensive Exam   | <u>35 points</u><br>100 points |

\*Points may be deducted for quizzes, tests and/or the final exam that are missed and made up at a later date.

The ARRT has established a minimum passing score of 75% The radiography program has established standards that are consistent with grading systems of other radiography programs. Letter grades for RADT 112 will be determined according to the following guidelines:

|          |   |     |   |
|----------|---|-----|---|
| 92       | - | 100 | A |
| 83       | - | 91  | B |
| 75       | - | 82  | C |
| 65       | - | 74  | D |
| below 65 |   |     | F |

**Other Course Information**

Formal admission to the Radiography Program is required prior to registration.

RADT 112 is the fourth course in the sequence of nine courses that comprise the professional portion of the curriculum and must be taken after successful completion of RADT 121.