Western Technical College

10526159 Radiographic Imaging

Course Outcome Summary

Course Information

Description	Introduces radiography students to the process and components of imaging. Students determine the factors that affect image quality including receptor exposure, spatial resolution, and distortion.
Career Cluster	Health Science
Instructional Level	A.A.S. - Associate in Applied Science
Total Credits	3

Textbooks

Essentials of Radiographic Physics and Imaging – with Access. 3rd Edition. Copyright 2020. Johnston, James. Publisher: Elsevier Science. **ISBN-13:** 978-0-323-56668-1. Required. (Part of Western Bundle Package **ISBN-13:** 978-0-443-15028-9)

Success Abilities

1. Refine Professionalism: Improve Critical Thinking
2. Refine Professionalism: Participate Collaboratively

Program Outcomes

1. Carryout the production and evaluation of radiographic images
2. Practice radiation safety principles
3. Apply critical thinking and problem-solving skills in the practice of diagnostic radiography

Course Competencies

1. **Explain the factors that affect exposure**

   Assessment Strategies
   1.1.   Oral, written, graphic and/or skill assessment

   Criteria
   1.1.   explanation includes the factors that affect radiographic contrast (e.g. high/low, long scale/short scale)
   1.2.   explanation includes the factors that affect radiographic receptor exposure
   1.3.   explanation includes the effect of prime factors on receptor exposure

   Learning Objectives
   1.a.   Explain how mAs affects Receptor Exposure
   1.b.   Explain how kVp affects Receptor Exposure
   1.c.   Explain how SID affects Receptor Exposure

2. **Explain the factors that affect geometric properties**

   Assessment Strategies
   2.1.   Oral, written, graphic and/or skill assessment

   Criteria
   2.1.   explanation includes factors that affect spatial resolution
   2.2.   explanation includes differentiation between size and shape distortion
   2.3.   explanation includes factors affecting size distortion
   2.4.   explanation includes factors affecting shape distortion

   Learning Objectives
   2.a.   Explain the factors that affect recorded detail
   2.b.   Differentiate between size and shape distortion

3. **Identify image receptor systems**

   Assessment Strategies
   3.1.   Oral, written, graphic and/or skill assessment

   Criteria
   3.1.   you identify basic image receptor systems
   3.2.   you explain the functions of the image receptor
   3.3.   you describe basic exposure indicator systems

   Learning Objectives
   3.a.   Identify the different digital receptors
   3.b.   Demonstrate the difference between CR and DR acquisition

4. **Analyze construction, purpose, and use of beam restricting devices**

   Assessment Strategies
   4.1.   Oral, written, graphic and/or skill assessment

   Criteria
   4.1.   analysis includes all of the significant types of beam restricting devices
   4.2.   analysis includes construction, purpose, and use
   4.3.   analysis includes impact on beam and image quality
   4.4.   analysis includes advantages and disadvantages

   Learning Objectives
   4.a.   List various types of beam restriction
   4.b.   Explain the purpose of beam restriction
   4.c.   Summarize the affect of beam restriction on image quality

5. **Explain the structure and function of radiographic grids**

   Assessment Strategies
   5.1.   Oral, written, graphic and/or skill assessment

   Criteria
   5.1.   you identify the types of grids

5.2.   you use grid related terminology
5.3.   you describe the structure of radiographic grids
5.4.   you explain the importance of radiographic grids
5.5.   you recognize errors in grid use
5.6.   you calculate technical factors according to grid use

Learning Objectives

5.a.   Describe the function of grids
5.b.   Explain the construction of grids
5.c.   Access the effect of grid ratio on patient dose and image quality
5.d.   Calculate exposure factors for grid usage

6.   Identify basic atomic structure

Assessment Strategies

6.1.   Oral, written, graphic and/or skill assessment

Criteria

6.1.   you identify the basic composition of an atom
6.2.   you distinguish among atomic number, mass number, atomic weight, and isotopic weight
6.3.   you distinguish between electron binding energy and electron energy level

Learning Objectives

6.a.   you identify the basic composition of an atom
6.b.   you distinguish among atomic number, mass number, atomic weight, and isotopic weight
6.c.   you distinguish between electron binding energy and electron energy level

7.   Relate images with various scales of contrast

Assessment Strategies

7.1.   Written Product

Criteria

You will know you are successful when

7.1.   you explain High Contrast and Low Contrast
7.2.   you relate High/Low Contrast to Short/Long Scale of Contrast
7.3.   you differentiate High Contrast and Low Contrast Images
7.4.   you differentiate Long Scale and Short Scales of Contrast
7.5.   you explain how kVp controls contrast
7.6.   You explain how influencing factors change scale of contrast

Learning Objectives

7.a.   Define Contrast
7.b.   Identify factors that affect Contrast
7.c.   Compare high and low contrast images
7.d.   Define long scale and short scale of contrast

8.   Summarize X-ray interactions with matter

Assessment Strategies

8.1.   Oral, written, graphic and/or skill assessment

Criteria

8.1.   you summarize photoelectric interactions
8.2.   you summarize Compton interactions
8.3.   you summarize interactions with matter
8.4.   you summarize the impact on image formation

Learning Objectives

8.a.   Describe photoelectric interactions
8.b.   Describe Compton interactions
8.c.   Understand photons will penetrate, scatter or be absorbed by matter
8.d.   Understand the affect of kVp on the type of interaction

9.   Explain the effect of distance on recorded detail

Assessment Strategies

9.1.   Written Product

Criteria

You will know you are successful when

9.1.   you explain SID, OID, and SOD
9.2.   you explain how recorded Detail is measured
9.3.   you explain the line pairs/mm needed for diagnostic images
9.4.   you explain how to compensate for change in SID to maintain Recorded Detail
9.5.   you differentiate images with different levels of recorded detail
9.6.   You explain the benefits/risks of higher recorded detail

Learning Objectives

9.a.   Compare Source-to-Image Distance (SID), Source-to-Object Distance (SOD and Object-to-Image Distance (OID)
9.b.   Define Recorded Detail
9.c.   Compare Images of varying levels of recorded detail
9.d.   Explain the change in line pairs/mm visualized at SID changes

10.   Explain affect of prime factors on image receptor exposure

Assessment Strategies

10.1.   Written Product

Criteria

You will know you are successful when

10.1.   you identify the 3 prime factors the technologist has control over
10.2.   you explain the relationship (direct, directly proportional, inverse, inversely proportional) between each prime factor and IR Exposure
10.3.   you utilize the Reciprocity law
10.4.   you utilize the Exposure Maintenance laws correctly to compensate for change in any of the prime factors
10.5.   you explain how to adjust technique using the Exposure Maintenance law and Direct Square Law
10.6.   you explain how to measure IR Exposure

Learning Objectives

10.a.   Identify the prime factors (mAs, kVp, Distance)
10.b.   Define Image Receptor Exposure
10.c.   Identify mAs as the controlling factor of IR Exposure
10.d.   Identify kVp and Distance as influencing factors of IR Exposure
10.e.   Apply the 50% Rule (mAs) and the 15% Rule (kVp)
10.f.   Apply the Inverse Square law and the Direct Square Law (SID)

11.   Summarize the factors affecting scatter and secondary radiation

Assessment Strategies

11.1.   Oral, written, graphic and/or skill assessment

Criteria

11.1.   you compare images
11.2.   you identify evidence of factors affecting scatter and secondary radiation
11.3.   you correctly determine which factors are responsible for effects
11.4.   you identify the impact of scatter and secondary radiations on image receptor exposure
11.5.   you identify the impact of scatter and secondary radiations on image contrast

Learning Objectives

11.a.   Describe how patient factors affect scatter production
11.b.   Describe how kVp affects scatter production
11.c.   Differentiate primary radiation from secondary radiation
11.d.   Describe how scatter production affects image quality

12.   Summarize filtration

Assessment Strategies

12.1.   Oral, written, graphic and/or skill assessment

Criteria

12.1.   you summarize the effects of different methods of beam filtration
12.2.   you explain added and inherent filtration
12.3.   you explain effects on the resultant image
12.4.   you compare compensating filtration and protective filtration
12.5.   you describe half-value layer (HVL)

Learning Objectives

12.a.   Identify the location of filtration in the x-ray beam
12.b.   List the types of filtration quantities found in the x-ray beam
12.c.   Decribe the effect that filtration has on the x-ray beam
12.d.   Define compensation filters
12.e.   Decribe the usages of compensation filters

13.   **Analyze exposure factor considerations involved in technique selections**

Assessment Strategies

13.1.   Oral, written, graphic and/or skill assessment

Criteria

13.1.   you use a technique chart to determine exposure factors
13.2.   you locate exposure information on a technique chart
13.3.   you differentiate between types of technique charts
13.4.   you recognize the effects of varying exposure factors on the image
13.5.   you adjust exposure factors to improve image quality
13.6.   you calculate the relationship between the technical factors of exposure
13.7.   you describe appropriate selection of exposure factors
13.8.   you describe the relationship between exposure factors and patient dose (exposure creep)

Learning Objectives

13.a.   Describe how mAs affects quantity of photons
13.b.   Describe how kVp affects quality and quality of photons
13.c.   Describe how SID affects quality and quantity of photons
13.d.   Reference technique chart (exposure system) to set control panel for exam
13.e.   Adapt technique to patient based on exposure system being used