COURSE OUTLINE

Course Number: RAD232
Course Title: Imaging Equipment & Radiography Seminar
Credits: 4

Lecture Hours: 3
Laboratory Hours: 2

Prerequisites: RAD217, RAD228
Co-Requisites: RAD224, RAD240

Catalog Description (2019-2020):
Evaluation of radiographic equipment in tandem with quality control standards to ensure optimal diagnostic images. Includes discussion of state, federal and non-governmental requirements. The seminar focuses on professional development and helps students prepare for the A.R.R.T. examination. [Spring offering] 3 lecture/2 laboratory hours

Required Texts/Other Materials:
Title: Correctec Online Review Course
Subscription Purchased online: https://www.correctecreview.com/modules.php?name=ReviewCourse&file=order
Title: Radiologic Science for Technologists
Author: Stewart Bushong
Publisher: Elsevier
Edition: 11th

Title: Radiography Review Value Pack
(Radiography Prep 9th edition & Lange Q&A Radiography Examination 11th edition)
Author: D.A. Saia
Publisher: McGraw Hill
Edition: 1st

Recommended Texts:
Title: Comprehensive Review of Radiography
Author: William Callaway
Publisher: Mosby
Edition: 7th

Title: Digital Radiography and PACS
Author: Christi Carter
Publisher: Elsevier
Edition: 3rd
Course Competencies/ Goals (Student Learning Outcomes):

Upon completion of this lecture course and clinical observation course, the student will be able to:

- Adapt to changes and varying clinical situations.
- Integrate appropriate personal and professional values into clinical practice.
- Apply the principles of total quality management.
- Report equipment malfunctions.
- Integrate the radiographer’s practice standards into clinical practice setting.
- Comply with departmental and institutional response to emergencies, disasters and accidents.
- Adhere to national, institutional and departmental standards, policies and procedures regarding care of patients, providing radiologic procedures and reducing medical errors.
- Determine corrective measures to improve inadequate images.

Course-specific Institutional Learning Goals (ILGs)/General Education Goals.

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.


Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 5. Social Science. Students will use social science theories and concepts to analyze human behavior and social and political institutions and to act as responsible citizens.

Institutional Learning Goal 6. Humanities. Students will analyze works in the fields of art, music, or theater; literature; philosophy and/or religious studies; and/or will gain competence in the use of a foreign language.
Institutional Learning Goal 7. History. Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

Institutional Learning Goal 8. Diversity and Global Perspective: Students will understand the importance of a global perspective and culturally diverse peoples


Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Course Competencies/Goals:

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

1. Explain image-intensified and digital fluoroscopy (ILG 2,4)
   a. Discuss gain and conversion factors as they relate to image intensification
2. Discuss conventional and digital fluoroscopic image formation (ILG 2,4)
   a. Identify fluoroscopic recording equipment
3. Indicate the purpose, construction and application of video camera tubes, TV monitors and video recorders (ILG 2, 4)
4. Explain the purpose, principles and application of linear tomography(ILG 4)
5. Define terminology associated with digital imaging systems and explain the basic concepts associated with digital image acquisition and display including the following concepts: (ILG 4)
   a. Types of digital receptors
      i. Image acquisition and extraction of data in Cassette-based vs. cassette-less digital systems
   b. Histogram analysis
   c. Automatic rescaling
   d. Exposure index/s-number and images
   e. Exposure variations and digital systems
   f. Dynamic range/latitude of screen film vs. digital systems
   g. PSP-based systems and exposure indices
   h. DAP of a flat panel system vs. exposure index for a PSP-based system
      i. Exposure indicator values of a digital system and relationship to technical factors, calibration, part/beam/IR alignment and patient exposure
   j. PSP and direct digital radiography: effects if background radiation and scatter
   k. Grid cut-off and Moiré effect in digital systems
   l. Quantum Mottle and DR systems
m. SNR & CNR
n. Histogram analysis and beam/part/IR alignment
o. Image processing for DR systems
p. Processes to minimize histogram analysis and rescaling errors
q. Acquisition precautions utilized to avoid poor quality images
r. ALARA and DR systems
s. Components of PACS
t. Functions of PACS
u. Teleradiography
v. DICOM & HL7
w. Accession Number, Worklist and usage
x. Diagnostic workstations vs. Clinical Display workstation
y. HIPAA concerns with electronic information

6. Describe the function of each component of an intensifying screen (ILG 4)
7. Explain latent image formation using radiographic film (ILG 3, 4)
8. Describe the function of each component of radiographic film (ILG 4)
9. Identify the features of a well-designed darkroom and an automatic processor (ILG 3, 4)
10. Differentiate between quality improvement/management, quality assurance and quality control (ILG 4)
11. Evaluate the basic QC tests in Radiography and Mammography (ILG 2, 3, 4)
12. List the benefits of a quality management program to the patient and to the department (ILG 4)
13. List element of a quality management program and discuss how each is related to the quality management program (ILG 4)
14. Discuss the proper test equipment/procedures for evaluating the operation of an x-ray generator (ILG 2, 4)
15. Utilize resources to apply the knowledge and skills necessary for employment as an entry-level radiography position (ILG 10, 11)
16. Develop an understanding of the value of skills that promote career-long learning, and instructing radiography students in the clinical environment. (ILG 10, 11)

**Note: All objectives listed above satisfy the course Goals/Competencies identified on page 2 of this Course Outline**

**Weekly Objectives - Lecture**

**Weeks 1-2: Image Intensified Fluoroscopy**
Following the completion of week 2, the student will be able to:
1. Explain image-intensified and digital fluoroscopy (ILG 2, 4)
   a. Discuss gain and conversion factors as they relate to image intensification
2. Discuss conventional and digital fluoroscopic image formation (ILG 2, 4)
   a. Identify fluoroscopic recording equipment
3. Indicate the purpose, construction and application of video camera tubes, TV monitors and video recorders (ILG 4)
4. Explain the purpose, principles and application of linear tomography (ILG 4)

**Week 3-6: Computers in Radiography, Computed & Digital Radiography**

At the end of week 6, the student will be able to:
1. Define terminology associated with digital imaging systems and explain the basic concepts associated with digital image acquisition and display including the following concepts: (ILG 2, 4)
   a. Types of digital receptors
      i. Image acquisition and extraction of data in Cassette-based vs. cassette-less digital systems
   b. Histogram analysis
   c. Automatic rescaling
   d. Exposure index/s-number and images
   e. Exposure variations and digital systems
   f. Dynamic range/latitude of screen film vs. digital systems
   g. PSP-based systems and exposure indices
   h. DAP of a flat panel system vs. exposure index for a PSP-based system
   i. Exposure indicator values of a digital system and relationship to technical factors, calibration, part/beam/IR alignment and patient exposure
   j. PSP and direct digital radiography: effects if background radiation and scatter
   k. Grid cut-off and Moiré effect in digital systems
   l. Quantum Mottle and DR systems
   m. SNR & CNR
   n. Histogram analysis and beam/part/IR alignment
   o. Image processing for DR systems
   p. Processes to minimize histogram analysis and rescaling errors
   q. Acquisition precautions utilized to avoid poor quality images
   r. ALARA and DR systems
   s. Components of PACS
   t. Functions of PACS
   u. Teleradiography
   v. DICOM & HL7
   w. Accession Number, Worklist and usage
   x. Diagnostic workstations vs. Clinical Display workstation
   y. HIPAA concerns with electronic information

**Weeks 7: Digital Fluoroscopy**

At the end of week 7, the student will be able to:
1. Discuss conventional and digital fluoroscopic image formation (ILG 4)
   a. Identify fluoroscopic recording equipment
2. Indicate the purpose, construction and application of video camera tubes, TV monitors and video recorders (ILG 2, 4)
3. Explain the purpose, principles and application of linear tomography (ILG 3, 4)

**Week 8: Film-Screen, Darkroom, Processing:**
At the end of week 8, the student will be able to:
1. Describe the function of each component of an intensifying screen (ILG 4)
2. Explain latent image formation using radiographic film (ILG 3, 4)
3. Describe the function of each component of radiographic film (ILG 4)
4. Identify the features of a well-designed darkroom and an automatic processor (ILG 3, 4)

**Weeks 9-11: Quality Assurance and Quality Control**
At the end of week 12, the student will be able to:
1. Differentiate between quality improvement/management, quality assurance and quality control (ILG 4)
2. List the benefits of a quality management program to the patient and to the department (ILG 4)
3. List element of a quality management program and discuss how each is related to the quality management program (ILG 4)
4. Discuss the proper test equipment/procedures for evaluating the operation of an x-ray generator (ILG 2, 4)
5. Read a cooling curve and tube rating chart (ILG 2, 4)
6. Perform basic calculations to determine the maximum number of exposures permitted given a generator’s heat loading capacity (ILG 2, 4)

**Week 12: Mammography and QC:**
At the end of week 13, the student will be able to:
1. Evaluate the basic QC tests in Radiography and Mammography
**Weekly Objectives – Laboratory**

**Weeks 1- 5, 7-11, 13: Registry Preparation**
Following the completion of week 14, the student will be able to:

1. Utilize examination materials to adequately prepare for the American Registry of Radiologic Technologists Examination in Radiography. (CG 16; ILG 2,4)

**Weeks 6, 12: ARRT Certification, Continuing Education**
Following the completion of week 12, the student will be able to:

1. Identify the essential requirements to apply for the American Registry of Radiologic Technologists (ARRT) Examination in Radiography and state licensure. (CG 16, ILG 4)
2. Explain the continuing education requirements to maintain (ARRT) registration and licensure essential for employment. (CG16, 17, ILG 4)
3. Skills that promote career-long learning, where the radiographer assumes the role of student and that of teacher. (CG 16)

**Week 14: Resume Writing, Interview Skills, Test Preparation**
Following the completion of week 15, the student will be able to:

1. Identify the essential elements of a resume; prepare a personal resume for an entry level position in diagnostic radiography. (CG 16, ILG 4)
2. Identify methods to gain employment in diagnostic radiography. (CG 16, ILG 4)
3. Develop the skills necessary to be a successful candidate for employment. (CG 16, ILG 4)
4. Answer common questions posed during a professional interview. (CG 16, ILG 1)
5. Identify strategies to minimize test anxiety and develop a time management plan to ensure preparation. (CG 16, ILG 1)
**Topical Outline**
The general plan for the fourteen (14) week semester identifies the topics to be discussed. Reading assignments will be provided.

<table>
<thead>
<tr>
<th>Week #</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 1      | Course Introduction  
Image Intensified Fluoroscopy  
Simulated Registry Exam 1 |
| 2      | Image Intensified Fluoroscopy  
Registry Preparation |
| 3      | Computers in Radiography  
Registry Preparation |
| 4      | Exam 1/ Computers in Radiography  
Simulated Registry Exam 2 |
| 5      | Computed & Digital Radiography  
Registry Preparation |
| 6      | Quiz 1/ Computed & Digital Radiography  
A.R.R.T Certification |
| 7      | Quiz 2/ Digital Fluoroscopy  
Simulated Registry Exam 3 |
| 8      | Exam 2/Screen-Film, Darkroom, Processing  
Registry Preparation |
| 9      | Quiz 3/ Quality Assurance and Quality Control  
Registry Preparation  
**SPRING RECESS -- NO CLASSES** |
| 10     | Quality Assurance and Quality Control  
Simulated Registry Exam 4 |
| 11     | Quality Assurance and Quality Control  
Registry Preparation |
| 12     | Exam 3  
Continuing Education Requirements |
13  Guest Speaker/ Mammography/ QC
Simulated Registry Exam 5

14  Quiz 4/ Review for Comprehensive Final Exam
Employment Preparation & Test Taking Strategies

TBA  Comprehensive Final Exam

**Quality Assurance Tentative Schedule**
Day:  Thursday 1:30 p.m.- 4:20 p.m.  Spring 2020
Instructor: Prof. Greer

<table>
<thead>
<tr>
<th>Week</th>
<th>Text</th>
<th>Chapters</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/23/20</td>
<td>Image Intensified Fluoroscopy</td>
<td>25</td>
<td>1-4</td>
</tr>
<tr>
<td>1/30/20</td>
<td>Image Intensified Fluoroscopy</td>
<td>25</td>
<td>1-4</td>
</tr>
<tr>
<td>2/6/20</td>
<td>Computers in Radiography</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>2/13/20</td>
<td>Exam 1/Computers in Radiography</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>2/20/20</td>
<td>Computed &amp; Digital Radiography</td>
<td>15-18</td>
<td>5</td>
</tr>
<tr>
<td>2/27/20</td>
<td>Quiz 1/Computed &amp; Digital Radiography</td>
<td>15-18</td>
<td>5</td>
</tr>
<tr>
<td>3/5/20</td>
<td>Quiz 2/Digital Fluoroscopy</td>
<td>26</td>
<td>1-4</td>
</tr>
<tr>
<td>3/12/20</td>
<td>Exam 2/Screen-Film, Darkroom, Processing</td>
<td>12</td>
<td>6-9</td>
</tr>
<tr>
<td>3/19/20</td>
<td><strong>Spring Recess</strong></td>
<td></td>
<td><strong>Enjoy!</strong></td>
</tr>
<tr>
<td>4/2/20</td>
<td>Quality Assurance and Quality Control</td>
<td>20-22</td>
<td>10-13</td>
</tr>
<tr>
<td>4/9/20</td>
<td>Quality Assurance and Quality Control</td>
<td>20-22</td>
<td>10-13</td>
</tr>
<tr>
<td>4/16/20</td>
<td>Exam 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/23/20</td>
<td>Guest Speaker/ Mammography and QC</td>
<td>23-24</td>
<td>11</td>
</tr>
<tr>
<td>4/30/20</td>
<td>Quiz 4/ Review for Comprehensive Final Exam</td>
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<tr>
<td>5/7/20</td>
<td>Comprehensive Final Exam</td>
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</tbody>
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Radiography Seminar  
Tentative Schedule Lab - Spring 2020  

Section 010:  Tuesday 10:00 a.m. – 11:50a.m.  
Section 020:  Tuesday 1:30 p.m. - 3:20 p.m.  
Instructor: Professor Sandra Kerr  

<table>
<thead>
<tr>
<th>WEEK #</th>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/21</td>
<td>Simulated Registry Exam 1</td>
</tr>
<tr>
<td>2</td>
<td>1/28</td>
<td>Registry Prep/Exam Review</td>
</tr>
<tr>
<td>3</td>
<td>2/4</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>4</td>
<td>2/11</td>
<td>Simulated Registry Exam 2</td>
</tr>
<tr>
<td>5</td>
<td>2/18</td>
<td>Registry Prep/Exam Review</td>
</tr>
<tr>
<td>6</td>
<td>2/25</td>
<td>A.R.R.T. Certification</td>
</tr>
<tr>
<td>7</td>
<td>3/3</td>
<td>Simulated Registry Exam 3</td>
</tr>
<tr>
<td>8</td>
<td>3/10</td>
<td>Registry Prep/Exam Review</td>
</tr>
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<td></td>
<td></td>
<td>SPRING BREAK</td>
</tr>
<tr>
<td>9</td>
<td>3/24</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>10</td>
<td>3/31</td>
<td>Exam 4 Correctec Exam 1:00PM All Students AD232</td>
</tr>
<tr>
<td>11</td>
<td>4/7</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>12</td>
<td>4/14</td>
<td>A.R.R.T. Continuing Education</td>
</tr>
<tr>
<td>13</td>
<td>4/21</td>
<td>Exam 5 Correctec Exam 1:00PM All Students AD232</td>
</tr>
<tr>
<td>14</td>
<td>4/28</td>
<td>Employment Preparation &amp; Test Taking Strategies</td>
</tr>
</tbody>
</table>
**Evaluation of Student Learning:**

The student must pass each section (laboratory and lecture) with a grade of “C+” (77%) or higher in order to pass the course and progress to RAD 242.

The following grading policy will be utilized:
Please refer to the table below for the breakdown of course components and weights.

A total of five (5) simulated examinations will be administered in class. Students must earn a 70% average or higher to earn a passing score in the laboratory section of this course. The lowest exam score will be dropped. Students are encouraged to meet with the course instructor following the first simulated registry examination to establish a study plan.

The laboratory score for the simulated examinations will be computed as follows:

<table>
<thead>
<tr>
<th>Simulated Registry Exam Average (5 exams)</th>
<th>Lab Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average &gt; 85%</td>
<td>95%</td>
</tr>
<tr>
<td>Average 80% - 84%</td>
<td>90%</td>
</tr>
<tr>
<td>Average 75% - 79%</td>
<td>85%</td>
</tr>
<tr>
<td>Average 71% - 74%</td>
<td>80%</td>
</tr>
<tr>
<td>Average = 70%</td>
<td>77%</td>
</tr>
<tr>
<td>Average &lt;70%</td>
<td>Earned %</td>
</tr>
</tbody>
</table>

Make-up exams are not permitted. If a student is absent for a simulated registry examination, the exam average will be calculated on the total number of exams taken during the current semester. The lowest exam score will not be dropped if in this instance.

Students will review radiography material in the computer lab. Selection of the topics should be based upon the results of the simulated examinations and consultation with the instructor. Students may choose to complete additional review material during open computer laboratory periods.
Grading
Laboratory (40% of Course Grade):
- Simulated Registry Examinations (80%)
- Continuing Education Plan (20%)

Lecture (60% of Course Grade):
- Quizzes (30%)
- Exams (40%)
- Final Exam (30%)

Attendance Policy:

1. Students are expected to be in attendance at the scheduled start time of all class and laboratory sessions; late arrival is disruptive to the class and instructor. Attendance will be taken for all lecture and lab sessions. The following grading system will be recorded for late arrival and absences:

   A. Lecture:
   1. Three points will be deducted from the final lecture grade for each late arrival to a scheduled lecture.
   2. Five points will be deducted from the final lecture grade for each absence from a scheduled lecture.

   B. Laboratory:
   1. Three points will be deducted from the final lab grade for each late arrival to a scheduled laboratory.
   2. A total of five (5) points will be deducted from the final laboratory grade for each lab test not taken on schedule. (Refer to item # 3-4 below)

2. Cell phones must be turned off upon entering the classroom. Receiving phone calls in tone or vibration mode are distracting to other students. Calls may not be made on personal cell phones during class time. Students may not charge their personal cell phone in the radiography classroom MS 314.

3. Make-up written tests are not permitted. Students must contact the instructor directly, leave a voice or e-mail message prior to the time of the scheduled exam. Students who miss an examination must provide a valid, documented excuse i.e. doctors note, vehicular repair by the next class session. If determined valid by the instructor, the comprehensive mid-term and/or final exam will be calculated with an additional weight equal to the missed
examination. As applicable, if the midterm examination is missed with a valid excuse, the weight of the exam will be added to the final exam. This will serve as validation of material comprehension covered on the missed examination. Any unexcused examination will earn a zero (0) grade.

4. Students who miss the final examination must contact the instructor by email or phone by the start of the examination administration. A valid, documented excuse must be submitted within two days of the final exam administration date. Valid excuses include emergent situations that arose unexpectedly and could not be mitigated at the time of the final exam. Examples include but are not limited to death in family, illness, vehicular repair with supporting documentation from the respective agency. Planned vacations, events, advanced request for time away are not considered valid excuses. If determined valid, the make-up final exam date will be determined by the course instructor in consultation with the student. The final exam must be taken prior to the start of the spring term to be eligible for the spring term radiography courses.

Academic Integrity:
Mercer County Community College is committed to Academic Integrity -- the honest, fair and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work. Academic Integrity is violated whenever a student:
A. Uses or obtains unauthorized assistance in any academic work.
B. Gives fraudulent assistance to another student.
C. Knowingly represents the work of others as his/her own, or represents previously completed academic work as current.
D. Fabricates data in support of an academic assignment.
E. Inappropriately or unethically uses technological means to gain academic advantage.
For any academic integrity violation, the faculty member will determine the penalty and shall notify the chairperson of the Academic Integrity Committee of the violation and the penalty imposed. Students should refer to the MCCC Student Calendar/Handbook (http://www.mccc.edu/academic_policies_integrity.shtml).

Accessibility:
Mercer County Community College is committed to ensuring the full participation of all students in its programs. If you have a documented differing ability or think that you may have a differing ability that is protected under the ADA or Section 504 of the Rehabilitation Act, please contact Arlene Stinson in LB216 (stinsona@mccc.edu) for information regarding support services.