COURSE OUTLINE

Course Number: RAD220   Course Title: Quality Assurance and Radiography Seminar   Credits: 4

Lecture Hours: 3   Prerequisites: RAD216
Laboratory Hours: 2   Co-Requisites: RAD224, RAD240

Catalog Description (2016-2017):
Evaluation of radiographic systems to assure consistent quality of diagnostic images. Includes a discussion of state, federal and non-governmental requirements. The seminar component of this course introduces computer applications in medical facilities and helps students prepare for the A.R.R.T. examination. (Spring 2017)

Required Texts/Other Materials:
Title: Rad Review Easy   Author: D.A. Saia   Publisher: McGraw Hill
Subscription: Six (6) months  Purchase through McGraw Hill www.radrevieweasy.com/

Title: Quality Management in the Imaging Sciences   Author: Jeffrey Papp   Publisher: Mosby   Edition: 5th

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

Recommended Texts:
Title: Radiography Prep   Author: D.A. Saia   Publisher: McGraw Hill   Edition: 8th

Revision Date/No Changes: Fall 2016
Course Coordinator: Sandra Kerr Voice: 609.570.3337  E-mail: kerrs@mccc.edu)
Course Competencies/Goals:

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

1. Differentiate between quality assurance and quality control concepts
2. Describe basic quality control tests specific to film-based imaging and wet chemical processing
3. Describe basic quality control tests of radiographic, fluoroscopic, ancillary and digital image processing equipment
4. Acquire familiarity with quality control testing equipment
5. Describe the purposes and techniques used to monitor and record image repeat rates in film-screen and digital imaging environments
6. Identify the basic components of a computer system
7. Describe the basic operation of a computed radiographic (CR) image processor
8. Describe basic internet concepts and how they are used in medical imaging (i.e., ISP, DNS and TCP/IP)
9. Describe how a PACS is used in medical imaging and the role of imaging standards such as DICOM and standard setting organizations such as NEMA
10. Apply the knowledge and skills necessary to perform vital sign assessment and venipuncture.
11. Utilize resources to apply the knowledge and skills necessary for employment as an entry-level radiography position
12. Develop an understanding of the value of skills that promote career-long learning, and instructing radiography students in the clinical environment.

Course-specific General Education Goals and Core Skills (Student Learning Outcomes):

General Education Knowledge Goals:

- **Goal 1. Communication.** Students will communicate effectively in both speech and writing.

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

- **Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
MCCC Core Skills

- **Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

- **Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

- **Goal D. 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.

- **Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

- **Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

**Units of Study in Detail:**

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.

**Weekly Objectives - Lecture**

**Weeks 1-2: Quality Assurance, Control, Film Darkrooms and Film Processing**

Following the completion of week 2, the student will be able to:

1. Define and distinguish between quality assurance and quality control.
2. Describe the purpose and process of a quality assurance committee.
3. Identify the persons responsible for quality assurance and control.
4. Describe the role that the radiology department chairperson plays in quality assurance.
5. Identify the features of a well-designed film darkroom.
6. Describe basic tests that are performed to evaluate darkrooms.
7. Identify the components of an automated film processor used in radiology.
8. Identify the chemicals used in automated film processing used in radiology.
9. Explain how film is processed.
10. Distinguish between incremental and flood replenishment and when each is used.

**Week 3-4: Implementation of Quality Control Testing**
At the end of week 4, the student will be able to:

1. Describe the purpose and process of quality control testing of film processing equipment.
2. Identify the key variables measured during sensitometric testing.
3. Analyze a quality control chart to determine the need for corrective action to stabilize automatic processor activity.
4. Describe the purpose of a film reject analysis program.
5. Describe the implementation of a film reject analysis program.
6. Perform basis calculations to arrive at ratios used to measure film reject rates.
7. Make objective comparisons of film reject rates across the country.
8. List the pros and cons of initiating a reject analysis program with the full knowledge of department staff.
9. Analyze radiographs to determine the cause of artifacts.

**Weeks 5-11: Testing of X-ray Generating Equipment**
At the end of week 11, the student will be able to:

1. Read a cooling curve and tube rating chart.
2. Perform basic calculations to determine the maximum number of exposures permitted given a generator’s heat loading capacity.
3. Describe the testing procedures for determining effective focal spot size, tube-grid alignment, generator linearity and repeatability, and half-value layer.
4. Describe the tests performed to measure kVp reliability, exposure timer accuracy, and AEC accuracy.
5. Describe the procedures to follow to test the reliability and output of fluoroscopic equipment.
6. Differentiate between automatic dose and gain control in fluoroscopic imaging.
7. Describe the tests performed on portable radiographic and fluoroscopic equipment.
8. Differentiate between conventional and capacitor-discharge portable units.
9. Compare and contrast the testing utilized on x-ray equipment in diagnostic radiology and mammography.
10. Explain the purpose and requirements of the Mammography Quality Standards Act.
11. Participate in hands-on testing of radiographic equipment in the laboratory.
12. Review concepts of quality assurance and control.
13. Test comprehensively on topics covered.

**Weeks 12-15: Computer Concepts and Applications**
At the end of week 15, the student will be able to:

1. Define computer-specific terms.
2. Identify computer components and their functions.
3. Differentiate between operating system and application software.
4. Describe the similarities and differences in processing and image quality between computed and digital radiography.
5. Discuss internet concepts and how they apply to medical imaging.
6. Identify different components of a PACS.
7. Define PACS-specific terms.

**Weekly Objectives – Laboratory**

**Weeks 1-5, 8, 11, 14: Registry Preparation**
Following the completion of week 15, the student will be able to:

1. Utilize examination materials to adequately prepare for the American Registry of Radiologic Technologists Examination in Radiography. (CG 11; GE 2, 4, D)

**Weeks 6-7: ARRT Certification, Continuing Education**
Following the completion of week 8, 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 11, GE 4, D)
2. Explain the continuing education requirements to maintain (ARRT) registration and licensure essential for employment. (CG11, 12, GE 4, D)
3. Skills that promote career-long learning, where the radiographer assumes the role of student and that of teacher. (CG 12, GE F)
**Weeks 9-10, 12-13: Vital Signs, Venipuncture**
Following the completion of week 14, the student will be able to:

1. Demonstrate the ability to competently obtain temperature, pulse, blood pressure, and respiratory vital signs; evaluate normal and abnormal values. (CG 12, GE 1, A, B, F)
2. Demonstrate the ability to competently perform venipuncture under simulated conditions. (CG 12, GE 1, A, B, F)

**Week 15: Resume Writing, Interview Skills**
Following the completion of week 9, 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 11, GE 4, D)
2. Identify methods to gain employment in diagnostic radiography. (CG 11, GE 4, D)
3. Develop the skills necessary to be a successful candidate for employment. (CG 11, GE 4, D, F)
4. Answer common questions posed during a professional interview. (CG 11, GE 1, A)

**Topical Outline**
The general plan for the fifteen (15) 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  
Introduction to Quality Management  
Simulated Registry Exam 1 |
| 2 | Quality Control Basics;  
Film Darkrooms; Film Processing  
Registry Preparation |
| 3 | Photographic Quality Control  
Registry Preparation |
| 4 | Reject-Repeat Analysis; Artifact Analysis  
Simulated Registry Exam 2 |
| 5 | Basic Tests; Testing of Ancillary Equipment  
Registry Preparation |
| 6 | Testing of Ancillary Equipment; Fluoroscopic Exposure Control  
A.R.R.T Certification |
Mammography Quality Standards
Continuing Education Requirements

Laboratory Practicum, part I
Simulated Registry Exam 3

**SPRING RECESS -- NO CLASSES**

Laboratory Practicum, Part II
Vital Signs Competency

Quality Assurance General Review
Vital Signs Competency

Quality Assurance Final Examination
Simulated Registry Exam 4

Computer Applications
Venipuncture Competency

Computer Applications
Venipuncture Competency

Computer Applications
Simulated Registry Examination 5

Computer Applications
Resumes and Interviews
# Quality Assurance Tentative Schedule

**Day:** Thursday 9:00 a.m.-11:50 a.m.  Spring 2017  
**Instructor:** Prof. Petrosky

<table>
<thead>
<tr>
<th>WEEK #</th>
<th>TOPIC</th>
<th>READING ASSIGNMENT (Papp Textbook)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/19/17</td>
<td>Introduction to Quality Management</td>
<td>Chapter 1</td>
</tr>
</tbody>
</table>
| 2       | QC Basics  
Film Darkrooms  
Film Processing | Chapters 2, 3 and 4  
Online Handouts  |
| 3       | **Test #1**  
Photographic Quality Control                           | Chapters 5, 6  
Online Handouts  |
| 4       | Repeat/Reject Analysis  
Artifact Analysis                                          | Chapter 10  
Online Handouts  |
| 5       | **Test #2**  
Basic Tests  
Radiographic Ancillary Equipment                          | Chapter 7  
Online Handouts  |
| 6       | Radiographic Ancillary Equipment (continued)  
Fluoroscopic Exposure Control                              | Chapter 7  
Chapter 8  |
| 7       | **Test #3**  
Advanced Imaging Equipment QC  
Mammography Quality Standards                               | Chapter 9  
Chapter 11  
Online Handouts  |
| 8       | Laboratory Demonstration & Practicum                    | In-Class Handouts  
(Schedule to be Posted)  |
| 3/16/17 | **SPRING RECESS**                                       | **ENJOY!**                                   |
| 9       | Laboratory Demonstration & Practicum                    | In-Class Handouts  
(Schedule to be Posted)  |
| 10      | General Review                                          |                                             |
| 11      | **Quality Assurance Final Examination**                 |                                             |
| 12      | Review Final Examination Results  
| 13      | **Quiz #1**  
Computer Concepts: The Internet                            | On-Line Handouts  |
| 14      | **Quiz #2**  
Computer Concepts: PACS                                     | On-Line Handouts  |
| 15      | **Quiz #3**  
Guest Lecturer (Topic to be Announced)                     |                                             |
Radiography Seminar  
Tentative Schedule Lab - Spring 2017  
Section 010: Tuesday 10:00 a.m. – 11:50 a.m.  
Section 020: Tuesday 1:00 p.m. - 2:50 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>1/17</td>
<td>Simulated Registry Exam 1</td>
</tr>
<tr>
<td>2</td>
<td>1/24</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>3</td>
<td>1/31</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>4</td>
<td>2/7</td>
<td>Simulated Registry Exam 2</td>
</tr>
<tr>
<td>5</td>
<td>2/14</td>
<td>Registry Prep</td>
</tr>
<tr>
<td>6</td>
<td>2/21</td>
<td>A.R.R.T. Certification</td>
</tr>
<tr>
<td>7</td>
<td>2/28</td>
<td>Continuing Education</td>
</tr>
<tr>
<td>8</td>
<td>3/7</td>
<td>Simulated Registry Exam 3</td>
</tr>
<tr>
<td></td>
<td>3/14</td>
<td>SPRING BREAK – RELAX</td>
</tr>
<tr>
<td>9</td>
<td>3/20</td>
<td>Monday Vital Signs Competency Lecture (All Students)</td>
</tr>
<tr>
<td>10</td>
<td>3/27</td>
<td>Monday Vital Signs Competency</td>
</tr>
<tr>
<td></td>
<td>4/3</td>
<td>Monday Students: CSMC, CRMC, CHS Hopewell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vital Signs Competency Students: HMC, UMCP, RWJ</td>
</tr>
<tr>
<td>11</td>
<td>4/4</td>
<td>Simulated Registry Exam 4</td>
</tr>
<tr>
<td>12</td>
<td>4/10</td>
<td>Monday Venipuncture Lecture (All Students)</td>
</tr>
<tr>
<td>13</td>
<td>4/17</td>
<td>Monday Venipuncture Competency</td>
</tr>
<tr>
<td></td>
<td>4/24</td>
<td>Monday Students: CSMC, CRMC, CHS Hopewell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Venipuncture Competency Students: HMC, UMCP, RWJ</td>
</tr>
<tr>
<td>14</td>
<td>4/25</td>
<td>Simulated Registry Exam 5</td>
</tr>
<tr>
<td>15</td>
<td>5/2</td>
<td>Resume Writing &amp; Interviews</td>
</tr>
</tbody>
</table>
**Evaluation of Student Learning:**

The student must pass each section (laboratory and lecture) with a grade of "C" (75%) or higher in order to pass the course. Please refer to the table below for the breakdown of course components and weights.

Students who do not attend the competency assessment sessions are not eligible to take the ARRT examination. These class sessions are mandatory and cannot be made up.

A total of five (5) simulated examinations will be administered in class. Students must earn a 65% average or higher to earn a passing score in the laboratory section of this course; the lowest exam score will be dropped. Refer to the grading below. 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 70% - 74%</td>
<td>80%</td>
</tr>
<tr>
<td>Average 66% - 69%</td>
<td>77%</td>
</tr>
<tr>
<td>Average = 65%</td>
<td>75%</td>
</tr>
<tr>
<td>Average &lt;65%</td>
<td>0%</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.
Competency verification in vital signs and venipuncture is required to take the A.R.R.T. Examination in Radiography. Therefore, students must attend the scheduled sessions. Makeup competency verification is not permitted. Students who do not attend the scheduled competency verification sessions will not be eligible to take the A.R.R.T. examination.

**Grading**

Laboratory (40% of Course Grade):
- Simulated Registry Examinations (75%)
- Continuing Education Plan (20%)
- Competency verification (5%)
  - Vital Signs
  - Venipuncture

Lecture (60% of Course Grade):
- Tests (40%)
- Final Exam (45%)
- Practicum (5%)
- Computer Concepts Quizzes (10%)

**Anticipated Approximate Fees**

<table>
<thead>
<tr>
<th>College of Saint Catherine Developmental Testing</th>
<th>$30.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>The American Registry of Radiologic Technologists Examination Application</td>
<td>$200.00</td>
</tr>
<tr>
<td>Mercer County Community College Graduation Application</td>
<td>$35.00</td>
</tr>
</tbody>
</table>

**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.

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 exams 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 a lecture 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. This will serve as verification of material comprehension covered on the missed examination.

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 for the complete policy and OMB210 (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.