



Course Number and Title: RAD 240 Radiographic Equipment Operation and Quality Assurance

Campus Location:

Georgetown, Wilmington

Effective Date:

2018-51

Prerequisite:

RAD 141

Co-Requisites:

none

Course Credits and Hours:

3.00 credits

3.00 lecture hours/week

0.00 lab hours/week

Course Description:

This course provides the student with knowledge of equipment and operating principles for radiographic, fluoroscopic, and mobile imaging. Skills in digital image acquisition and processing are enhanced. Digital image display, quality control, and quality assurance are also discussed.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

Radiologic Technology Student Handbook Separate instructor handouts and assignments

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Relate the basic principles of electricity to x-ray production. (CCC 1, 6; PGC 1, 4)
2. Analyze the basic design features, imaging principles, and technical considerations for all fixed and mobile radiographic and fluoroscopic equipment. (CCC 1, 2, 3, 4, 5, 6; PGC 1, 2, 3, 4)
3. Diagram and describe the function of the components that make up the basic x-ray circuit and x-ray tube. (CCC 1, 2, 5, 6; PGC 1, 4)
4. Examine digital equipment processing and display features. (CCC 1, 2, 6; PGC 1, 4)
5. Analyze quality control and quality assurance for all equipment. (CCC 1, 2, 3, 4, 5, 6; PGC 1, 4)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Relate the basic principles of electricity to x-ray production.
 1. Define and state the unit of measurement for current, potential difference, and resistance.
 2. Discuss electrical safety features such as ground and circuit breakers.
 3. Apply Ohm's law to practical voltage problems.
 4. Identify the basic circuit elements, their symbols, and functions.
 5. Define *electric generator*, and describe its basic structure.
 6. Illustrate the sine curves for alternating current and direct current.
 7. State the function and operating principle of a transformer.
 8. Solve problems using the transformer law formula.
 9. Differentiate between step-up and step-down transformers.
 10. Explain the principle and application of autotransformers and capacitors in the x-ray circuit.
 11. Explain the purpose of rectification.
 12. Compare and contrast half-wave versus full-wave rectification.
2. Analyze the basic design features, imaging principles, and technical considerations for all fixed and mobile radiographic and fluoroscopic equipment.
 1. Analyze the operating range and console design features of all diagnostic equipment.
 2. Discuss the specific features of x-ray tables, tube supports, collimators, wall units, and Potter-Bucky diaphragms.
 3. Compare and contrast single phase, three-phase 6-pulse, three-phase 12-pulse, and high frequency generators in reference to voltage ripple, pulses per second, and efficiency.
 4. Discuss the advantages and limitations of fixed and mobile equipment.
 5. Define *fluoroscopy*.
 6. State the function and components of the image intensifier.
 7. Explain minification gain, flux gain, and brightness gain.
 8. Determine the purpose, advantages, and disadvantages of multiframe image intensifiers.
 9. Discuss methods of viewing and recording the fluoroscopic image.
3. Diagram and describe the function of the components that make up the basic x-ray circuit and x-ray tube.
 1. Review construction of the x-ray tube, including methods to extend tube life.
 2. Subdivide the x-ray circuit, and state the function of each division.
 3. Categorize the components of the main circuit indicating which components are found on the primary, low voltage side and which are found on the secondary, high voltage side.
 4. Analyze the components of the filament circuit.
 5. Associate the technical factor controls on the x-ray console with the circuit components and with their location within the x-ray circuit.
 6. Diagram the components of the basic x-ray circuit.
4. Examine digital equipment processing and display features.
 1. Review digital image acquisition methods to include photostimulable phosphor plates, direct/indirect conversion, and thin-film transistor (TFT) arrays.
 2. Compare and contrast digital equipment preprocessing and post-processing functions.
 3. Analyze image acquisition errors to include histogram analysis, low intensity radiation response, and scatter.
 4. Describe display monitor characteristics and image evaluation criteria.
 5. Discuss data management systems to include hospital information system (HIS), radiology information system (RIS), picture archive and communication system (PACS), digital imaging and communications in medicine (DICOM), and teleradiography.
 6. Introduce the components and operating features of computed tomography (CT).
5. Analyze quality control and quality assurance for all equipment.
 1. Define *quality control* and *quality assurance*.
 2. Describe, perform, and interpret various quality control tests (radiographic and fluoroscopic) to include:
 1. Automatic exposure control (AEC)
 2. Automatic brightness systems (ABS)
 3. Protective apparel
 4. Focal spot size
 5. Milliampere-seconds (mAs) reciprocity
 6. Exposure reproducibility
 7. mA linearity
 8. Kilovoltage potential (kVp) accuracy
 9. Timer accuracy
 10. Collimator and beam alignment
 11. Digital image receptors
 12. Display monitors
 13. Fluoroscopic exposure rate and source-to-skin distance (SSD)

Evaluation Criteria/Policies:

Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	-	100	=	A
83	-	91	=	B
75	-	82	=	C
0	-	74	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Exams (4) (equally weighted)	85%
Formative: Quizzes and Assignments (equally weighted)	15%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Demonstrate clinical competence by performing a full range of radiologic procedures on all patient populations.
2. Professionally utilize verbal, nonverbal and written communication in patient care intervention and professional relationships.
3. Demonstrate professional growth and development by practicing the profession's code of ethics and comply with the profession's scope of practice.
4. Demonstrate critical thinking and problem solving skills in the performance of radiographic procedures.

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.