



RDT 204 Principles of Exposure III

COURSE DESCRIPTION: This course is a continuation of the concepts covered in RDT 104 and RDT 154. Imaging equipment design and requirements are also covered, and an introduction to quality control is provided. *Two lecture hours per week. Prerequisites: RDT 104 and RDT 154 with grades of "C" or better or permission of the department head. Course fee: \$40. Materials fee: \$15. Usually offered in the fall.*

CREDIT HOURS: 2 credit hours
Tuesdays: 12:30pm – 2:30pm

PLACEMENT: Fall Semester - Second year of Program (2009)

PREREQUISITES: Permission of the Department Head

FACULTY: Karie Solebrino, M.S., R.T.(R)(CT)(ARRT)

TEXTBOOK: Radiologic Science for Technologists; Physics, Biology and Protection., Bushong, Stewart. Harcourt (2008)

Principles of Radiographic Imaging, Carlton and Alder.
Mosby (2006).

Lange Q & A for Radiography Exam with Prep; D.A. Saia

Mosby's Comprehensive Review of Radiography: The Complete Study Guide and Care Planer; William Callaway

WEBSITE: Students are required to subscribe to www.radrevieweasy.com in preparation for the ARRT licensure examination. Achievement tests from the website will be completed throughout the semester.

COURSE OBJECTIVES:

1. Define potential difference, current and resistance.
2. Describe the characteristics of direct and alternating currents.
3. Describe electrical protective devices.
4. Identify the general components and function of the primary, secondary and filament circuits.
5. Identify the function of solid-state rectification .
6. Compare single phase, three phase, high frequency and falling load generators in terms of radiation production and efficiency.
7. Discuss permanent installation of radiographic equipment in terms of purpose, components, types and applications.
8. Demonstrate operation of various types of permanently installed radiographic equipment.
9. Discuss mobile units in terms of purpose, components, types and applications.
10. Demonstrate operation of various types of mobile unit radiographic equipment.
11. Discuss the application of automatic exposure control (AEC) devices.
12. Explain image-intensified fluoroscopy.
13. Discuss gain and conversion factors as related to image intensification.
14. Discuss fluoroscopic image formation in terms of image size and brightness.
15. Indicate the purpose, construction and application of video camera tubes, TV monitors and video recorders.
16. Identify fluoroscopic recording equipment.
17. Explain the purpose, principles and application of conventional tomography.
18. Discuss the purpose and procedure of radiographic magnification.
19. Discuss electronic imaging equipment used in radiography and fluoroscopy.
20. Discuss flat panel detectors used in digital electronic x-ray equipment.
21. Differentiate between quality improvement/management, quality assurance and quality control.
22. List the benefits of a quality management program to the patient and to the department.
23. List elements of a quality management program and discuss how each is related to the quality management program.
24. Discuss the proper test equipment/procedures for evaluating the operation of the x-ray generator.
25. Evaluate the performance of the x-ray generator.
26. Identify various types of computers.
27. Review contrast, density, recorded detail and how the manipulation of these factors effects the image.
28. Review Scatter control and the appropriate use of grids to improve image quality.
29. Review Radiographic Processing
30. Review Image Receptors
31. Review Radiographic Processing

ACADEMIC HONESTY POLICY:

Students found exhibiting any of the following types of behavior during or in the preparation/performance of any quiz, project, report, test, or final exam will receive a zero "0" for the assignment, and the student conduct violation will be referred to the Student-Faculty Disciplinary Committee. Cheating will not be tolerated in the Radiologic Technology program. Students found cheating will be DISMISSED from the Radiologic Technology program.

- A. Cheating is defined as the act of obtaining information or data improperly or by dishonest or deceitful means; and
- B. Plagiarism is defined as the copying or imitating the language, ideas, or thoughts of another author and presenting them as one's original work, the copying of a theme or section from a book or magazine without giving credit in a footnote or copying from the manuscript of another student.

CLASSROOM RULES

1. Cell phones or other electronic communicating devices may not be used in the classroom and must be in silent mode.
2. No talking during lectures. It is highly disruptive to your classmates and leads to lower grades due to course material being misunderstood.
3. If you have a question, ask the instructor not the person next to you.
4. Team work is required and expected of all students regardless of how much you dislike working in groups.
5. Arrive to class prior to class start time.
6. Come prepared to class. Complete reading assignments at home and be ready to participate in team-based learning exercises.
7. Sleeping is not permitted in class. Students who are sleeping will be dismissed from the classroom.

SUGGESTIONS FOR STUDENT SUCCESS

1. Never hesitate to ask for help. Please communicate with the course instructor any problems that you are having for assistance to be provided.
 - Email the course instructor through WebCT
 - Office: (410) 572-8741
 - Cell: (443) 880-3365
2. Read chapter assignments before coming into class.
3. Take good notes.
4. Tape lectures and rewrite notes when you leave class.
5. Work in teams. We are all in this together. Develop study teams and collaborate with peers. Many times you can learn more effectively with a study partner or in groups.
6. Set goals for achievement. Use good time management.
7. Study everyday for every class thirty minutes. Cramming is not a good study plan for comprehensive final exams.

QUIZZES

Quizzes will be administered throughout the semester to measure the student's comprehensive knowledge of course concepts and to encourage class attendance. Students are expected to complete chapter reading assignments before scheduled class meetings for quiz preparation. Quizzes will not be announced and will be given at different times throughout the class session. Students who report late or leave early may miss a quiz. Quizzes will cover topics in RDT 104, RDT 154, and RDT 204. **NO MAKE-UP QUIZZES WILL BE ADMINISTERED.**

ASSIGNMENTS

1. Students will complete questions reiterating exposure topics discussed in lecture. Questions will be submitted through the Blackboard assignment's link. **NO LATE CHAPTER QUESTIONS WILL BE ACCEPTED. All assignments are due by 11:00pm EST through Blackboard.**
2. Students will complete exposure charts for specified positioning exams. Each student will determine radiographic exposure techniques applicable for their OWN BODY HABITUS. Students will complete two exposure charts (one for PRMC and one for AGH). After completing each technique chart according to their personal body habitus, the student will have the clinical instructor at AGH and PRMC review and sign the technique chart indicating that the student has selected appropriate exposure factors for each projection based on their own body habitus. Students will work on this project throughout the entire semester in clinic and submit the two exposure charts at the conclusion of the semester for an assignment grade in RDT 104. Information contained within the exposure charts will be present on the RDT 204 comprehensive final examination. **AGH AND PRMC EXPOSURE CHARTS ARE DUE DECEMBER 1, 2009 at 4:30 pm. NO LATE ASSIGNMENTS WILL BE ACCEPTED.**
3. **Electronic Information Literacy Writing Assignment:** Choose an electronic article in a radiology journal or website on radiation exposure. The topic could be related to patient dose, occupational dose, exposure related to a specific modality, radiation safety precautions, or any other topic associated with objectives defined in this course. Follow the grading rubric located at the conclusion of the course syllabus for content requirements and grading criteria. **All assignments must be submitted by 11:00pm EST on the day it is due. NO LATE ASSIGNMENTS WILL BE ACCEPTED.**
4. Students will complete registry review workbook assignments. After completing the assigned test, the student is to submit a Microsoft Word document with all of the answers to the questions. Highlight or bold the questions marked incorrect. Document the total number of incorrect answers and at least three areas the student plans to review. Submit the document in blackboard through the assignments link. **NO LATE WORKBOOK ASSIGNMENTS WILL BE ACCEPTED. All assignments are due by 11:00 pm EST through Blackboard. FAILURE TO COMPLETELY FOLLOW THE DIRECTIONS FOR THIS ASSIGNMENT WILL RESULT IN A GRADE OF 0.**

ACHIEVEMENT TESTS

Students will complete registry review tests in [www.radrevieweasy](http://www.radrevieweasy.com). The score received is the score earned. Grades will not be rounded. After completing the assigned tests in [www.radrevieweasy](http://www.radrevieweasy.com), the student is to print the results of the test for submission. In addition, the student must show the course instructor the completed test in [www.radrevieweasy](http://www.radrevieweasy.com) to receive credit for this assignment. All radrevieweasy assignments are due by 4:30 pm on the due date. **Failure to print a report of the test and show the instructor the results on the computer will result in a grade of 0 for the assignment. NO LATE ASSIGNMENTS WILL BE ACCEPTED.**

TESTS:

Chapter tests will be administered throughout the semester. Three tests will be administered in RDT 204. **NO MAKE-UP TESTS WILL BE ADMINISTERED.**

COMPREHENSIVE FINAL EXAMINATION:

The comprehensive final examination will cover all information from RDT 104, RDT 154, and RDT 204. **NO MAKE-UP FINAL WILL BE ADMINISTERED.**

ATTENDANCE

Students are expected to attend every class. Students are expected to arrive before class begins and remain in class for the entire session. Personal appointments should be made for non-class times and will not be excused. **Missing two classes** will result in the student's final grade being deducted by one Letter grade which will equal a 10% deduction. **Missing three classes** will result in the student's final grade being deducted by two Letter grades which will equal a 20% deduction. **Missing four classes will result in a grade of "F"**. Students failing to attend class will not be tolerated in the Radiologic Technology program.

ANY STUDENT ARRIVING 15 MINUTES OR MORE AFTER THE START OF THE CLASS OR WHO LEAVES THE CLASS 15 MINUTES OR MORE EARLY WILL RECEIVE AN UNEXCUSED ABSENCE. MISSING 15 MINUTES OR MORE OF CLASS IS CONSIDERED AN ABSENCE FOR THE ENTIRE CLASS PERIOD.

ONLY EXTREME CIRCUMSTANCES WILL BE CONSIDERED FOR AN EXCUSED ABSENCE AND IS AT THE DISCRETION OF THE COURSE INSTRUCTOR.

COURSE EVALUATION

Assignments	5%
Quizzes	5%
Achievement Tests	10%
Chapter Tests	20%
Comprehensive Final Exam	60%

Grading Scale

A	93 – 100
B	84 – 92
C	75 – 83
D	66 – 74
F	0 – 65

A FINAL GRADE BELOW A 75.0% RESULTS IN COURSE FAILURE AND DISMISSAL FROM THE RADIOLOGIC TECHNOLOGY PROGRAM. GRADES ARE NOT ROUNDED. A FINAL GRADE OF 74.9% WILL RESULT IN COURSE FAILURE AND DISMISSAL FROM THE RADIOLOGIC TECHNOLOGY PROGRAM.

TENTATIVE STUDENT LECTURE SCHEDULE

September	15	Lecture:	Review Exposure I and II
	22	Lecture:	Review Exposure I and II
	29	Lecture:	Review Exposure I and II
October	6	TEST ONE	
	13	Lecture:	Chapter 21: Fluoroscopy Chapter 27: Digital Fluoroscopy
	20	Lecture:	Chapter 21: Special Imaging (Old Bushong) Chapter 41: Tomography
	27	Lecture:	Chapter 24: Computer Science Chapter 25: Computed Radiography Chapter 26: Digital Radiography
November	3	TEST TWO	
	10	Lecture:	Chapter 5: Electricity, Magnetism, Electromagnetism
	17	Lecture:	Chapter 5: Electricity, Magnetism, Electromagnetism Chapter 7: The X-Ray Tube
	24	Lecture:	Chapter 6: The X-Ray Imaging System
December	1	Lecture:	Chapter 6: The X-Ray Imaging System
	8	TEST THREE	
	16	COMPREHENSIVE FINAL EXAMINATION (RDT 104, RDT 154, and RDT 204)	

RDT 204: Principles of Exposure III
Assignment Schedule

September	18	Complete Mosby Book Review of Image Production and Evaluation Test (Chapter 4). Submit Results and Report through Blackboard. Follow directions in course syllabus. Due 11:00 pm EST.
	25	Complete Radiography Prep Book Part IV Image Production and Evaluation. Submit Results and Report through Blackboard. Follow directions in course syllabus. Due 11:00 pm EST.
October	2	Complete Lange Q&A Radiography Examination Book Chapter 4 Image Production and Evaluation. Submit Results and Report through Blackboard. Follow directions in course syllabus. Due 11:00 pm EST.
	13	Complete 400 Questions in radrevieweasy for Image Production and Evaluation. Print report and show instructor score on the computer by 4:30 pm.
	16	Complete chapter questions. Submit through blackboard 11:00 pm EST.
	20	Complete 400 Questions in radrevieweasy for Image Production and Evaluation. Print report and show instructor score on the computer by 4:30 pm.
October	23	Complete chapter questions. Submit through blackboard 11:00 pm EST.
	27	Complete 400 Questions in radrevieweasy for Equipment Operation. Print report and show instructor score on the computer by 4:30 pm.
	30	Complete chapter questions. Submit through blackboard 11:00 pm EST.

November	3	Complete 400 Questions in radrevieweasy for Equipment Operation. Print report and show instructor score on the computer by 4:30 pm.
	13	Complete chapter questions. Submit through blackboard 11:00 pm EST.
	20	Complete chapter questions. Submit through blackboard 11:00 pm EST.
	28	Electronic Information Literacy Paper Due 11:00 pm EST in Blackboard.
December	1	Complete 400 Questions in radrevieweasy for Equipment Operation. Print report and show instructor score on the computer by 4:30 pm. Complete 400 Questions in radrevieweasy for Image Production and Evaluation. Print report and show instructor score on the computer by 4:30 pm.
	4	Complete chapter questions. Submit through blackboard 11:00 pm EST.

RDT 204 Electronic Information Literacy Writing Assignment

Criteria (36 Total Points)	0 Non-performance	2 Basic	4 Proficient
Spelling	More than three spelling errors in the discussion post.	Multiple spelling errors or fragment use through discussion.	Discussion post is free of spelling errors.
Grammar/Sentence Structure	More than three grammatical and/or sentence structure errors in the discussion post.	There are up to three grammatical/ sentence structure errors present in the discussion post.	Discussion post is free of grammatical or sentence structure errors.
Length	Writing Assignment is two pages or less in length or does not follow Times New Roman Font guidelines.	Writing Assignment is three to four pages in length.	Writing Assignment is a minimum of five full pages with 12 point Times New Roman Font and 1 inch margins.
Content	Does not provide enough content to support topic.	Demonstrates a basic understanding of paper topic and provides a minimum of three specific content areas.	Demonstrates an understanding of paper topic by relating information from resources into patient care scenarios. Topic is relevant to the course with a minimum of five examples related to the clinical environment.
Explains rationale for choosing topic.	Does not explain rationale for choosing topic.	Provides a basic explanation for choosing topic.	Explains rationale for choosing topic by demonstrating a correlation between topic and content covered in lecture.
Describes lessons learned.	Does not explain lessons learned from research.	Describes up to three lessons learned from research.	Describes a minimum of four lessons learned from research.
Works cited in APA Format	Does not provide references in APA format and/or the required minimum number of resources.	Less than four electronic resources are provided in APA format.	A minimum of four electronic resources are provided in APA format.
Entire Paper following APA Style	Does not adhere to APA style throughout paper content	APA format attempted with up to two errors present within paper.	Does adhere to APA style throughout paper content.
Paper Components	Paper does not include a title page, less than five pages of content,	Paper includes some but not all of the required components.	Paper includes a title page, five pages of content, and a works cited page.

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Chapters 21 and 27 Exposure Questions
Due October 16, 2009

1. Who is accredited with the invention of Fluoroscopy? What is Fluoroscopy? How does Fluoroscopy differ from conventional radiography?
2. What is angiography? List three angiography procedures.
3. Where is the x-ray tube in a typical fluoroscopy unit? Where is the image intensifier positioned in reference to the patient?
4. What tube current is employed for Fluoroscopy procedures? Why? How does this differ from the tube current used in conventional radiography?
5. Define ABC. What purpose does this serve?
6. What is the principle advantage of image-intensified Fluoroscopy? Why?
7. What is the difference between rod and cone vision? Which has better visual acuity?
8. Explain the difference between photoemission and thermionic emission.
9. Define the following terms/parts associated with the eye:
 - A. Rods
 - B. Cones
 - C. Cornea
 - D. Lens
 - E. Retina
 - F. Iris
 - G. Fovea Centralis
 - H. Photopic vision
 - I. Scotopic vision
 - J. Visual acuity
 - K. Contrast perception

10. Briefly describe the historical foundation of Fluoroscopy.
11. What kVp is used for barium studies? What kVp is used for exams using iodinated contrast media?
12. Describe the steps of the Image Intensification process.
13. Define the following terms pertaining to Image Intensification:
 - A. Flux gain
 - B. Brightness Gain
 - C. Minification Gain
14. Describe multifield image intensification.
15. What are three consequences for using the magnification mode?
16. What is vignetting?
17. Describe television monitoring systems for fluoroscopic images. What is the vidicon?
18. What two methods are used to electronically convert the visible image on the output phosphor into an electronic signal?
19. How are television camera tubes coupled to the Image Intensifier?
20. Explain the differences between cassette spot film versus the photospot camera.
21. What is the difference between conventional Fluoroscopy and Digital Fluoroscopy?
22. Describe the charge-coupled device. List the advantages of charge-coupled devices for medical imaging.
23. Describe flat panel image receptors. List the advantages of the flat panel image receptors over CCD coupled image intensifiers in digital fluoroscopy.
24. What is the flat panel image display?
25. What is DSA? What is the mask image? What are misregistration artifacts?
26. Describe the roadmapping procedure. What purpose does it serve?
27. How is patient dose different with DF then conventional fluoroscopy methods?

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Chapters 21 and 41 Questions

Due October 23, 2009 11:00pm

1. Define Tomography. What are uses of Tomography?
2. What is linear tomography?
3. Define the following terms associated with tomography:
 - A. Fulcrum
 - B. Object plane
 - C. Tomographic angle
 - D. Section thickness
 - E. Motion blur
 - F. Tomographic section
 - G. Focal plane
4. What is zonography? What purpose does it serve?
5. What is panoramic tomography?
6. What is magnification radiography? How is magnification radiography achieved?
7. Describe the following types of motion associated with tomography:
 - A. Curvilinear
 - B. Circular
 - C. Elliptical
 - D. Figure Eight
 - E. Trispiral
 - F. Hypocycloidal
8. How is exposure technique determined for tomography?

RDT 204: Principles of Exposure III
Chapters 24, 25, and 26 Exposure Questions
Due October 30, 2009

1. What is hardware? Provide five examples.
2. What is a Workstation? What are components of a workstation?
3. What is the processing hardware?
4. Define ROM and RAM.
5. How is digital information stored?
6. What is software? List three examples.
7. What is the difference between analog and digital information?
8. Define bits and bytes.
9. List two examples of computer languages.
10. What equipment is required for CR image acquisition?
11. Describe CR acquisition process to include the exposure and the transition of the latent image into the manifest image.
12. How does the image receptor response function differ between CR and conventional radiography?
13. List the sources of image noise in screen-film radiography.
14. List the sources of image noise in computed radiography.
15. How is workload changed by using CR instead of conventional radiography?
16. Define the following DR terms:
 - A. Capture Element
 - B. Coupling Element
 - C. Collection Element
17. What is a charge-coupled device? What is the sensitivity and dynamic range?
18. Discuss indirect and direct capture acquisition as it contributes to DR systems.

19. What are the advantages and disadvantages of implementing digital mammography?

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Chapter 5 Exposure Questions

Due November 13, 2009

1. Define electrostatics. Define electrification.
2. Describe the four general laws of electrostatics.
3. Define electric potential. What is the unit of measurement?
4. What is electrostatics?
5. Define the following terms and provide examples of each:
 - A. Superconductor
 - B. Conductor
 - C. Insulator
 - D. Semiconductor
6. What is an electric current? What is the unit of measurement for electric current?
7. Define the following terms:
 - A. Resistor
 - B. Battery
 - C. Capacitor
 - D. Ammeter
 - E. Voltmeter
 - F. Switch
 - G. Transformer
 - H. Rheostat
 - I. Diode
8. Describe the difference between a series and parallel circuit.
9. Define DC and AC power.

10. What unit measure electric power?
11. What is magnetism?
12. Name and describe the three principle types of magnets?
13. Define the following terms:
 - A. Nonmagnetic
 - B. Diamagnetic
 - C. Ferromagnetic
 - D. Paramagnetic
14. Describe the magnetic laws.
15. Define electromagnetism.
16. Define electromagnetic induction.
17. List the factors of Faraday' s Law.
18. What is the role of the transformer in the x-ray circuit?
19. What are step-up transformers, step-down transformers, and autotransformers?
20. Define closed-core transformer and shell-type transformer.

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Chapter 7 Exposure Questions

Due November 20, 2009

1. What is the purpose of the protective tube housing? Where do x-rays leave the tube? What is the maximum leakage radiation from the x-ray tube?
2. What are the two primary parts of the x-ray tube? What are the components within each of the main sections of the tube?
3. What is the saturation current?
4. What are the ranges of possible focal spot sizes?
5. What are three reasons why tungsten is the material of choice for the target?
6. Explain the line focus principle.
7. What is off-focus radiation?
8. What are reasons for x-ray tube failure?
9. What is the purpose of x-ray tube rating charts?
10. What are anode cooling charts?

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Chapter 6 Exposure Questions

Due December 4, 2009

1. What are the three principle parts of an x-ray imaging system?
2. What exposure parameters are controlled by the Radiologic Technologist?
3. What voltage is required for x-ray tube operation? What is the line compensator?
4. What is an autotransformer? What is its purpose within the x-ray circuit?
5. What is kVp? What does it control? What are minor and major kVp adjustments?
6. What is mA? What does it control?

7. What is a filament transformer?
8. What are exposure timers? Explain the following types of timers:
 - A. Synchronous Timers
 - B. Electronic Timers
 - C. mAs timers
9. What is the AEC? What is the back-up time?
10. What is the high-voltage generator?
11. Describe the high-voltage transformer. What current is required for transformers? How is the primary voltage measured? How is the secondary voltage measured? How is the primary current measured? How is the secondary current measured?
12. Define the following terms related to tube current:
 - A. Rectifier
 - B. Half-wave rectification
 - C. Full-wave rectification
 - D. Single-phase power
 - E. Three-phase power
 - F. High-frequency generator
 - G. Capacitor discharge generator
13. What is voltage ripple? How is voltage ripple different for single phase, three-phase six-pulse, three-phase twelve-pulse, and high frequency machines?
14. List and describe each component of the x-ray circuit.