

9-2013

AHXR 221.01: Radiographic Imaging II

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Recommended Citation

Delaney, Anne V., "AHXR 221.01: Radiographic Imaging II" (2013). *Syllabi*. 194.
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**MISSOULA COLLEGE - UNIVERSITY OF MONTANA,
DEPARTMENT OF RADIOLOGY TECHNOLOGY**

COURSE SYLLABUS

COURSE NUMBER AND TITLE: AHXR 221 Radiographic Imaging II

DATE REVISED: Fall

SEMESTER CREDITS: 3

CLASS HOURS: Friday 10:40 -12:00

PREREQUISITES: SCN 202N Anatomy and Physiology, AHXR 100 Introduction to Diagnostic Imaging, AXHR 140 Radiographic Methods, AHXR 240 Radiological Methods II, AHXR 121 Radiographic Imaging I, AHXR 195 Radiographic Clinical: I, AHXR 195 Radiographic Clinical: II

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Office: AD 07A

Office Hours: Thursday 1:00 – 2:30 or by appointment

RELATIONSHIP TO PROGRAM: Students will learn the detailed imaging techniques of digitized imaging. Special imaging techniques such as MRI, CT and Mammography will be included in this imaging course. This course provides an ASRT approved education program, Essentials of Digital Imaging, which will be completed outside of class.

COURSE DESCRIPTION: Content of the class is designed to establish students with a knowledge base in more sophisticated imaging techniques found in advance imaging procedures.

STUDENT PERFORMANCE OUTCOMES:

Upon completion of this course, the student will be able to:

1. Discuss the impact the internet has on the distribution of health information.
2. Define terminology associated with digital imaging systems.
3. Describe the various types of digital receptors.
4. Discuss the fundamentals of digital radiography, distinguishing between cassette-based systems and cassette-less systems.

5. Compare the image acquisition and extraction of cassette-based vs. cassette-less systems, including detector mechanism, initial image processing, histogram analysis, automatic rescaling and exposure index determination.
6. Describe the evaluative criteria for digital radiography detectors.
7. Describe the response of digital detectors to exposure variations.
8. Compare the advantages and limits of each system.
9. Compare dynamic range to latitude of a screen/film receptor system to that of a digital radiography system.
10. Describe the histogram and the process or histogram analysis as it relates to automatic rescaling and determining an exposure indicator.
11. Describe or identify the exposure indices used by each photostimulable phosphor (PSP)-based system.
12. Relate the receptor exposure indicator values to technical factors, system calibration, part/beam/plate alignment and patient exposure.
13. Describe image acquisition precautions necessary for CR imaging.
14. Describe the response of PSP systems to background and scatter radiation
15. Utilize appropriate means of scatter control.
16. Avoid grid use errors associated with grid cut off and Moiré effect.
17. Identify common limitations and technical problems encountered when using PSP systems.
18. Employ appropriate beam/part/receptor alignment to avoid histogram analysis errors.
19. Describe the various image processing employed for digital images.
20. Associate impact of image processing parameters to the image appearance.
21. Associate effects of inappropriate processing on image clarity or conspicuity.
22. Describe the fundamental physical principles of exposure for digital detectors.
23. Apply the fundamental principles to digital detectors.
24. Describe the components of the CT imaging system.
25. Differentiate between conventional and spiral/helical CT scanning.
26. Explain the functions of collimators in CT.
27. List the CT computer data processing steps.
28. Name the functions of the array processor used for image reconstruction.
29. Define the term “algorithm” and explain its impact on image scan factors and reconstruction.
30. Define the terms “raw data” and “image data”.
31. Explain the difference between reconstructing and reformatting an image.
32. Describe the application of the following terms to CT:
 - Pixel
 - Matrix
 - Voxel
 - Linear attenuation coefficient
 - CT/Hounsfield number.
 - Partial volume averaging.
 - Window width (ww) and window level (wl).
 - Spatial resolution.
 - Contrast resolution.
 - Noise.

- Annotation.
 - Regions of interest (ROI).
 - Standard vs. volumetric data acquisition.
33. Name the common controls found on CT operator consoles and describe how and why each is used.
 34. Identify the types and appearance of artifacts most commonly affecting CT images
 35. Explain how artifacts can be reduced or eliminated.
 36. List and describe current data storage techniques used in CT.
 37. Name the radiation protection devices that can be used to reduce patient dose in CT and describe the correct application of each.

STUDENT PERFORMANCE ASSESSMENT METHODS AND GRADING PROCEDURES:

Grading scale:

- 100-90 A**
- 89-80 B**
- 79-70 C**
- 69-60 D**

Total grade will be determined by total points received on homework, tests, final paper and final exam.

Quizzes	20%
Exams	20%
Presentation:	30%
Final Exam:	<u>30%</u>
	100%

Instructions for Semester Presentation: The special project for this course will be a team presentation. Students will form groups of 2. Each group will be assigned a week to prepare and present the material from the chosen chapter in the Bushong text. Presentations must include outside research about the topic and a complete understanding of the chapter information. The presentation may be power point or any means that presenters determine will assist students in understanding the material. Teams and dates of presentation will be determined the first day of class. It is expected that you will interview experts in the subject that you are presenting and **you will also do research**. I expect that you to work on this assignment outside of clinical time by formally scheduling time to interview experts and work on your presentation.

The purpose of the presentation is to instruct fellow students, provide opportunity for discussion and to deepen your understanding of the subject material. Presenters will also gain confidence in presenting ideas and information. Teams should schedule a time to meet with me prior to presenting the chapter. The purpose of the meeting is to help each group have a clear understanding of the material, answer questions about confusing material and find other sources of research. You may assign questions or homework assignments prior to the week you are presenting if you like. You may want to play a game such as jeopardy to help make the material more interesting. On the day of the

presentation, please give me 3 multiple choice test questions (including the answers) that relate to the information that you present to the class. Presentations will be graded for content, interest, attention to detail, and depth of understanding of the material. To alleviate the problem of one student doing all of the work, students will be given an opportunity to evaluate their team member and grades will also be based on team contribution.

You will also be responsible to complete the 7 modules of *Essentials of Digital Imaging* that are provided to you through Moodle. The modules will be assigned every other week, similar to the online physics you did spring semester.

We will be meeting 1.5 hours each week, on Friday from 10:40 – 12:00. The expectation that you will spend a good deal of time on the project and the on-line assignments

Quizzes: You will be required to take the online *Essentials of Digital Imaging* from the ASRT this semester. You will be given 2 weeks to complete each module and a quiz must be completed by the end of the second week.

Note: Students must pass this course with a “B” (80%) in order to continue with the Radiology Technology Program the next semester.

ATTENDANCE POLICY: All students are expected to come to class each day, on time and prepared by having read the required chapters. Class participation is expected and may impact grades that are borderline.

ACADEMIC INTEGRITY:

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by The University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://life.umt.edu/vpsa/student_conduct.php.

DISABILITY ACCOMODATION:

Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely way. Please speak with me after class or in my office. Please be prepared to provide a letter from your DSS Coordinator. For more information, visit the Disabilities Services website at <http://www.umt.edu/dss/> or call 406-243-2243 (voice/text)

Note: Instructor reserves the right to modify syllabi and assignments as needed based on faculty, student, and/or environmental circumstances.

REQUIRED TEXT: *Radiologic Science for Technologists*; 10th Edition, Stewart C. Bushong.

AHXR 221 Radiographic Imaging (subject to change)

DATE	READING ASSIGNMENT	Class Lecture	WORK DUE
August 30	Introduction	Review of student handbook	Students select chapter to present
September 6	Bushong Chapter 19	Screen-film Radiographic Artifacts	Anne
September 13 1:00 – 2:30	DVD Health Continuum		EDI Module 1 Fundamentals
September 20	Bushong Chapter 20	Screen-Film Radiographic Quality Control	Anne
September 27	Bushong Chapter 21	Digital Radiographic Artifacts	EDI Module 2 Processing
October 4	Bushong Chapter 22	Digital Radiographic Control	
October 11	Exam		EDI Module 3 Display
October 18	Bushong Chapter 23	Mammography	
October 25	Bushong Chapter 24	Mammography Quality Control	EDI Module 4 Image Analysis
November 1	Bushong Chapter 25 Bushong Chapter 26	Fluoroscopy Digital Fluoroscopy	
November 8	DVD Radiation Safety		EDI Module 5 PACS
November 15	Exam		
November 22	Bushong Chapter 27	Interventional Radiography	EDI Module 6 Dose Reduction and Patient Safety
November 29	Thanksgiving		
December 6	Bushong Chapter 28 Review	Computed Tomography	EDI Module 7 Quality
December 10-14	Finals		

Revised 7/18/14