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AHXR 121.01: Radiographic Imaging I

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MISSOULA COLLEGE UNIVERSITY OF MONTANA

DEPARTMENT OF RADIOLOGY TECHNOLOGY

COURSE SYLLABUS

COURSE NUMBER AND TITLE: AHXR 121 Radiographic Imaging I

DATE REVISED: Spring 2015

SEMESTER CREDITS: 4 credits

CLASS TIME: Mondays, 8:10 – 10:00 GH 9A

PREREQUISITES: AHXR 100 Introduction to Diagnostic Imaging, AHXR 140 Radiographic Methods

Faculty: Anne Delaney, anne.delaney@umontana.edu

Phone: 243-7809

Office: AD 07

Office Hours: by Appointment

RELATIONSHIP TO PROGRAM: Students will gain a clear understanding of how radiological physics directly relates to image quality and an understanding of the how why to manipulate factors to improve image quality.

COURSE DESCRIPTION: Content of the class is designed to establish students with a knowledge base in factors that govern and influence the production and recording of radiographic images.

STUDENT PERFORMANCE OUTCOMES:

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

1. Define potential difference, current and resistance.
2. Identify the general components and functions of the tube and filament circuits.
3. Compare generators in terms of radiation produced and efficiency.
4. Discuss permanent installation of radiographic equipment in terms of purpose, components, types and applications.
5. Demonstrate operation of various types of permanently installed and mobile radiographic equipment.
6. Discuss mobile units in terms of purpose, components, types and applications.
7. Describe functions of components of automatic exposure control (AEC) devices.
8. Demonstrate proper use of AEC devices.

9. Identify the components of diagnostic x-ray tubes.
10. Explain protocols used to extend x-ray tube life.
11. Explain image-intensified and digital fluoroscopy.
12. Indicate the purpose, construction and application of video camera tubes, CCD and TV monitors.
13. Differentiate between quality improvement/management, quality assurance and quality control.
14. List the benefits of a quality control to the patient and to the department.
15. Discuss the proper test equipment/procedures for evaluating the operation of an x-ray generator.
16. Evaluate the results of basic QC tests.
17. Discuss the basic principles of operation of various imaging modalities and radiation therapy.
18. Differentiate between size and shape distortion.
19. Perform calculations to determine image magnification and percent magnification.
20. Summarize the relationship of factors that control and affect distortion.
21. Summarize the relationship of factors affecting exposure latitude.
22. Explain the rationale for using beam-limiting devices.
23. Describe the operation and applications for different types of beam-limiting devices.
24. Explain how beam filtration affects x-ray beam intensity, beam quality and resultant patient exposure.
25. Describe the change in the half-value layer (HVL) when filtration is added or removed in the beam.
26. Summarize the relationship of factors affecting scattered and secondary radiation.
27. Evaluate the effects of scattered radiation on the image.
28. Compare grid types.
29. Select the most appropriate grid for a given clinical situation.
30. Interpret grid efficiency in terms of grid ratio and frequency.
31. Summarize the factors that influence grid cutoff.
32. Evaluate grid artifacts.
33. Explain the use of standardized radiographic technique charts.
34. Explain exposure factor considerations involved in selecting techniques.
35. Compare fixed kilovoltage peak (kVp) and variable kVp systems.
36. Apply conversion factors for changes in the following areas: distance, grid, image receptors, reciprocity law and 15 percent rule.
37. Describe fundamental atomic structure.
38. Explain the processes of ionization and excitation.
39. Describe the electromagnetic spectrum.
40. Describe wavelength and frequency and how they are related to velocity.
41. Explain the relationship of energy, wavelength and frequency.
42. Explain the wave-particle duality phenomena.
43. Identify the properties of x-rays.
44. Describe the processes of ionization and excitation.
45. Describe charged and uncharged forms of particulate radiation.
46. Differentiate between ionizing and nonionizing radiation.

47. Describe radioactivity and radioactive decay in terms of alpha, beta and gamma mission.
48. Compare the production of bremsstrahlung and characteristic radiations.
49. Describe the conditions necessary to produce x-radiation.
50. Describe the x-ray emission spectra.
51. Identify the factors that affect the x-ray emission spectra.
52. Discuss various photon interactions with matter by describing the interaction, relation to atomic number, photon energy and part density, and their applications in diagnostic radiology.
53. Discuss relationships of wavelength and frequency to beam characteristics.
54. Discuss the clinical significance of the photoelectric and modified scattering interactions in diagnostic imaging.

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 Online exams, midterm, class participation and final exam.

Online exams	40%
Mid term	20%
Participation	20%
Final Exam:	<u>20%</u>
	100%

Class requirements: All students are expected to complete the online modules each week that they are due. Students are also required to read and be able to discuss each assigned chapter during the weekly class. On-line exams will be made available, on Monday, the week prior to the day they are due. You will be given 2 hours to complete exam. Exams are required to be completed by 5:00 pm on the Monday due. All questions should to be asked either through Moodle, on the discussion board or during class so all students can learn from your questions. I am also available almost any time for extra help if you need it.

Class participation will be assessed by your participation in the discussion board questions and in class discussions. One student will be assigned each week to write a discussion board question on a confusing topic from the **textbook** reading. All students must try to answer the question and the student who asked the question, must respond to one fellow student's submission to receive full credit for class participation. To receive full credit, answers must be well thought out and show that significant thought was used to answer the question. Please do not simply say I agree with the previous answer.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or disciplinary sanction by the University.

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.

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.

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

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

Online modules and exams can be found on <https://evolve.elsevier.com> , you will need to register for the course and pay through Elsevier.

How students self-enroll into my course.

Simply provide your students the steps below to self-enroll into your instructor-led course on Evolve

1. Go to <http://evolve.elsevier.com/enrollcourseid>.
2. Enter the Course ID, **97278_adelaney6_1002**, in the field provided and click **Submit**.
3. If you are enrolling into a content-protected course, you will be prompted to purchase access or enter your access code at this time. If you are prompted to enter a code and were not aware you would need to do so, please contact your instructor for further information regarding access to the course or if you should proceed with purchasing instant access.

To purchase instant access, select the radio button that states, "**I want to purchase instant access for \$XX.XX**". You will be directed to supply credit card and billing information.

If you have a 12 character access code, select the "**I have an access code**" radio button. Type your code in the field provided, and select **Apply**. *Note: access codes may only be used one time.

Next, select the **Redeem/Checkout**

4. If you are a returning user enter your Evolve username and password and click **Login**. If you are new to Evolve enter your name, email, desired password, institution information (if applicable), and click **Continue**.

5. Click the **Registered User Agreement** link located at the bottom right. Once you have read this information check the "**Yes, I accept the Registered user Agreement**" box if you agree. Click **Submit**.
6. Your enrollment confirmation will appear on the next page. A confirmation email will additionally be sent to your instructor to inform them of your enrollment. If you are a new user, your Evolve username and password will also be emailed to you.

Click the **Get Started** link to get to your course located in the My Evolve area. Visit and bookmark <http://evolve.elsevier.com/student> for future log in.

AHXR 121 Imaging I, Spring 2015, Subject to change

Week	READING ASSIGNMENT	Module Exam Due
Jan 26	Introduction Chapter 1 Bushong Online- Essential Concepts	Module 1 Feb 2
Feb 2	Chapters 2 & 3 Bushong Online – The Structure of Matter Online – Electromagnetic Energy	Module 2 Module 3 Feb 2
Feb 9	Chapter 4 Bushong Online –Electricity, Magnetism, and Electromagnetism	Module 4 Feb 9
Feb 16	PRESIDENT’S DAY HOLIDAY	No Class
Feb 23	Chapter 5 Bushong Online –The x-ray Imaging System	Module 5 Feb 23
Mar 2	TEST Chapter 1-5	Mid Term, Given in class
Mar 9	Chapter 6 & 7 Bushong Online – The x-ray Tube Online – X-ray Production	Module 6 Module 7 Mar 9
Mar 16	Chapter 8 & 9 Online – X-ray Emission Online –X-ray Interaction with Matter	Module 8 Mar 16 Module 9
Mar 26	Test Chapters 6 - 9 Online – Concepts of Radiographic Image Quality	Mid Term, Given in class Module 10 Mar 26
Mar 30	SPRING BREAK	
Apr 6	Chapter 10 & 11 Bushong Online – Control of Scatter Radiation	Module 11 Apr 6
Apr 13	Chapter 12 &13 Bushong Online- Screen – Film Radiography Online –Screen-Film Radiographic Technique	Module 12 Module 13 Apr 13
Apr 20	Chapter 14 &15 Bushong Online –Computers in Medical Imaging Online –Computed Radiography	Module 14 Module 15 Apr 20
Apr 27	Chapter 16 & 17 Bushong Online –Digital Radiography Online –Digital Radiography Technique	Module 16 Module 17 Apr 27
May 4	Chapter 18 Bushong Online – Viewing the Digital Radiographic Image In-class review	Module 18 May 4
Finals Week		

Rev April 9, 2015