RAD-660: RADIOGRAPHY REVIEW II

Effective Term
Fall 2024

BOT Approval Date
12/14/2023

Discipline
RAD - Radiologic Technology

Course Number
660

Course Title
Radiography Review II

Short Title
RAD Review II

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lecture Units
1.00

Total Units
1

Hours

Lecture Contact Hours
16-18

Out of Class Hours Lecture
32-36

Total Contact Hours
16 - 18

Total Out of Class Hours
32 - 36

Total Student Learning Hours
48 - 54

Distance Education
No

Catalog Description
This course provides a comprehensive review of selected radiologic technology topics to support the student in the clinical internship phase and to prepare for the American Registry of Radiologic Technologists examination upon graduation. Topics include radiation physics, patient care and medical ethics, quality assurance and control, and radiobiology.

Attach Supporting Documents
LMI.pdf

Requisites

Pre or corequisite(s)

Prerequisite or corequisite(s) (must be taken simultaneously if not taken before)
RAD-645 (with a grade of C or better)
and RAD-650 (with a grade of C or better).

Codes

TOP Code (CB 03)
1225.00* - *Radiologic Technology

CIP Code
51.0911 - Radiologic Technology/Science - Radiographer.

Student Accountability Model (SAM) Priority Code (CB 09)
C - Clearly Occupational

Noncredit Category (CB 22)
Y - Credit Course

Repeatability Code
No

Grading Option
Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Radiological Technology	End

CSU Area(s)

IGETC Area(s)

Learning Objectives

Learning Objectives

Learning Objective
1. Appraise the functions of the imaging system and x-ray tube.
2. Determine the different types of radiation interactions with atoms and the effects on radiation protection.
3. Apply appropriate patient care techniques, under any circumstance, during radiographic procedures.
4. Infer the patient's pathologic condition as a variable in performing radiologic examinations.
5. Analyze the medical and legal aspects of patient care in a hospital setting focusing on obtaining informed consent on patients that have different gender identities, race, culture, and disabilities.
6. Analyze the physical and biological factors that affect radiation response.
7. Summarize the radiation dose-response relationships.
8. Compare and contrast the fundamental principles of radiobiology including the early and late effects of radiation exposure.
9. Summarize all factors that affect patient radiation dose.
10. Evaluate the importance of quality control for x-ray equipment and how it affects the performance of the department personnel.
11. Analyze how quality assurance procedures benefit patient safety, reduced radiation exposure, determine efficacy of patient care, influence departmental efficiency, and increase image quality.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will list the American Society of Radiologic Technologists Code of Ethics.
2. Students will generate alternative approaches to patients with physical challenges and diverse backgrounds.
3. Students will evaluate compliance of radiography equipment in quality control procedures.

Program Learning Outcomes

Learning Outcome
Apply positioning skills in all required radiographic examinations.
Select appropriate technical factors for radiographic examinations.
Practice radiation protection for all radiographic examinations.
Employ proper patient care techniques and effectively provide care for patients from diverse groups/populations.
Demonstrate oral and written communication skills.
Relate to and anticipate the needs of the doctors and technologists.
Adjust to changes, situations, patient conditions, updated evidence-based practice, and deviation from the normal routine.
Demonstrate knowledge of ethical requirements for an entry level radiographer along with ethical practices in a healthcare setting.
Understand professional obligations upon gaining the ARRT status.

Institutional Learning Outcomes

Aesthetic Awareness: The student will identify and evaluate how aesthetic expression leads to an appreciation of social and cultural context as well as the values of art and nature.
Communication: The student will effectively express and exchange ideas through listening, speaking, reading, writing, visual works, and other modes of interpersonal expression.
Critical Thinking: The student will analyze problems, gather and synthesize relevant information, evaluate ideas, information, and evaluate alternative points of view to create, innovate and implement effective solutions.
Cultural Awareness and Humility: The student will demonstrate knowledge of and sensitivity toward individuals of diverse ethnicity, age, gender, sexual orientation, and religious affiliations, as well as toward those individuals with diverse abilities and socio-economic classes to respectfully interact with individuals of diverse perspectives, beliefs and values while being mindful of the limitation of their own cultural frameworks.
Information and Technology Literacy: The student will access, interpret, evaluate, and apply relevant information sources and digital media effectively, and in an ethical and legal manner.
Scientific Awareness: The student will apply the scientific method of inquiry to assess potential solutions for real-life challenges by employing science-based knowledge and methodologies in daily life.
Social Awareness: The student will recognize and analyze the interconnectedness of global, national, and local concerns, analyzing cultural, political, social, and environmental issues from multiple perspectives and appreciate similarities and differences among cultures.
Civic
Personal
and Professional Responsibility

Content

Course Lecture Content

1. Radiation physics
    a. Operating console
    b. Autotransformer
    c. Step up and step down transformers
    d. Exposure timers
        i. Mechanical
        ii. Reciprocating
        iii. Electronic
        iv. Automatic exposure control devices
    e. Voltage rectification

        i. Single and three phase
        ii. Radiation quantity and quality
    f. Voltage ripple
    g. Power rating
    h. Components of the x-ray tube
        i. Anode
        ii. Cathode
        iii. Filament
        iv. Focal spot
    i. X-ray tube failure
    j. Rating charts
        i. Technique
        ii. Tube rating
        iii. Anode
        iv. Housing
    k. X-ray production
    l. X-ray interaction with matter
        i. Photoelectric effect
        ii. Modified
        iii. Unmodified
        iv. Photodisintegration
        v. Pair production
2. Patient care
    a. Infection control
    b. Vital signs
    c. Medical emergencies
    d. Aseptic techniques
    e. Drug administration and venipuncture
    f. Asepsis
    g. Sterilization
    h. Emergency Procedures and trauma
    i. Mechanics and Safety
3. Professionalism and medical ethics in imaging
    a. Legal aspects
        i. Patient confidentiality
        ii. Malpractice liability
    b. Consent procedures
        i. Communication and empathy in cross-cultural patient interactions
        ii. Ethical considerations when obtaining informed consent from individuals with disabilities
        iii. Healthcare professional approach for transgender and non-binary individuals
    c. Grieving process
4. Compassionate care
    a. Emotional Support
        i. Radiographer's role in diagnosis and prognosis
        ii. End of life and do not resuscitate directives
    b. Diversity and inclusion influences
        i. Patient care and communication
        ii. Healthcare policies
        iii. Decision-making during imaging procedures
    c. Communication
        i. Gender identities, race, culture, and disabilities challenges and solutions
        ii. Utilizing interpreters
        iii. Patient understanding of instructions for pre- and post- exam care
        iv. Interacting with other healthcare professionals
    d. Health care team

i. Interactions with other health care professionals
ii. Hospital chain of command
iii. Assisting radiologists
e. American society of radiologic technologists code of ethics
i. Non-discrimination
ii. Professionalism
iii. Patient care and education
iv. Diagnosis restrictions
5. Quality control and assurance
a. Exposure artifacts
i. Types
ii. Causes and corrections
b. Image receptor artifacts
i. Types
ii. Causes and corrections
c. Filtration
i. Inherent, added, and total
ii. Compensating filters
d. Collimation
i. Body part
ii. Radiation protection
iii. Affects on exposure to image receptor
e. Focal spot size
f. Timer accuracy
g. Exposure linearity
h. Exposure reproducibility
i. Protective apparel
j. Digital display device quality control
6. Radiobiology
a. Law of Bergonie and Tribondeau
b. Physical factors that affect radiosensitivity
c. Radiation dose-response relationships
d. Direct and indirect effects
e. Target theory
f. Linear energy transfer
g. Relative biologic effectiveness
h. Oxygen enhancement ratio
7. Radiation Protection
a. Cardinal principles
i. Time
ii. Shielding
iii. Distance
b. Effective dose
i. Definition
ii. Factors that influence
c. Protective barriers
d. Equipment design
i. Windows and doors
ii. Wall height and lead thickness
e. Pregnant patients
i. Exposure control
ii. Collimation
iii. Radiation protection apparel
f. Dose limits
i. Whole body
ii. Lens of the eye

iii. Extremities
iv. Cumulative dose

Methods of Instruction

Method

Lecture

Integration

Lectures will be used to review information about the radiation physics, patient care and medical ethics, quality assurance and control, and radiobiology. The instructor will present the topics through well-organized PowerPoint presentations.

Method

Discussion

Integration

Classroom discussions will allow students to recall concepts in radiation physics, patient care and medical ethics, quality assurance and control, and radiobiology. These discussions will enable students to reflect on their clinical encounters, showcasing how these principles are put into practice. Additionally, students will be able to discuss with each other and the instructor, patient care and ethical challenges that arise in an imaging department while performing radiographic tasks. One example would be the challenges of obtaining informed consent from patients that may have different race, culture, and disabilities and who do not understand or have questions about the consent policy. This situation becomes particularly pertinent as the students' progress through their clinical training, entering more specialized and intricate examinations that necessitate the prior signing of informed consent forms before the procedures commence.

Method

In-class Exercises

Integration

In-class exercises, such as review questions and practice problems provided by the instructor, will promote student recall of the lecture material, and give the student an opportunity to ask questions or ask for further help in understanding and applying concepts.

Method

Reading

Integration

To complement the lecture material, students are encouraged to study specific chapters from the mandatory textbook authored by S. Bushong, namely Chapter 29-40 for radiobiology and chapters 20 and 23 for quality assurance and control. In the patient care textbook by T. Ryan, students will need to read and review the information in chapters 2-14.

Methods of Evaluation

Method

Exams/Tests

Integration

Exams and tests will be used to measure student's recall and application of radiation physics, patient care, medical ethics, and quality control procedures. The exams will be multiple choice to help prepare the students to pass the American Registry of Radiologic Technologists exam which is also in multiple choice format. Exams and tests are graded on accuracy.

Method

Homework

Integration

Homework is assigned to help the students review the material presented in lecture. Homework assignments consist of questions on radiation physics, patient care techniques, quality control and assurance, and medical legal issues are presented by the instructor to assist students in recalling lecture material and to serve as a guide through the reading material. Furthermore, these assignments offer students the chance to explore the processes involved in obtaining informed consent and effectively managing communication challenges with patients from diverse backgrounds, including those with varying races, cultures, and disabilities.

For added engagement and interaction among students, there's an option to complete these assignments in small groups during class, fostering discussions. These assignments serve as an assessment tool to gauge a student's grasp of the concepts, as they are graded based on both accuracy and completion.

Method

Papers

Integration

Students will write a paper on the crucial concept of informed consent within the context of radiology procedures. The paper objectives requirements outline the key components of informed consent, its ethical and legal implications, and insights into practical aspects such as communication skills for a diverse patient population, and documentation for obtaining informed consent. Additionally, the paper explores imaging procedure case scenarios to highlight the importance of informed consent and how to resolve issues in patient interactions. The paper will be graded for grammar, quality and accuracy of the information.

Assignments

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Read and review the following chapters in the required textbook by S. Bushong:
Chapters 6-10 for radiation physics, and chapters 20 and 23 for quality control and assurance.

Read and review the following chapters in the required textbook by T. Ryan:
Chapters 2-14 on patient care skills and medical legal ethics.

Come to class prepared to answer questions from the instructor based on the information you read. You will participate in classroom discussions on the topics of radiation physics, patient care and medical legal issues, and quality control and assurance.

Grades for this assignment will be based on participation in discussions and the accuracy of the information you provide.

Assignment Type

Writing

In-class and/or outside of class

Outside of class

Formative or Summative

Summative

Assignment

Write a paper that explores the critical aspects of obtaining informed consent in fluoroscopic procedures that require contrast media, with a particular focus on addressing the challenges encountered when dealing with a diverse population of patients from different racial, cultural, and disability backgrounds. This assignment will provide you with valuable insights into the practical application of ethical principles in healthcare settings.

Assignment Overview:

Introduction: Begin by introducing the concept of informed consent in fluoroscopic procedures using contrast media, highlighting its significance in patient care. List the basic parts of the informed consent form used in the radiography department at your affiliated hospital.

Diverse Populations and Cultural Sensitivity: Discuss how patients from various racial, cultural, and disability backgrounds may have unique perspectives and communication styles. Emphasize the importance of cultural sensitivity in the informed consent process. How would you approach a patient that may have gender identity issues when obtaining informed consent for a hysterosalpingogram? How would you obtain a patient's understanding if they did not speak the same language as you do? What tools are available at your hospital, or what procedures are in place, to help with obtaining informed consent from patients?

Real-Life Experience: Include a real-life experience from your clinical training where you or a supervising radiographer encountered challenges while obtaining informed consent from a patient. Be sure to describe the scenario, the patient's background, and the specific difficulties faced.

Challenges and Solutions: Analyze the challenges encountered in your chosen scenario and what effective solutions were used to overcome them. Consider communication barriers, cultural competence, and any other relevant factors. Were the solutions the best option? Were there other options you wish you had chosen? What would you do differently next time?

Conclusion: Summarize the key takeaways from your assignment and reiterate the significance of obtaining informed consent in diverse healthcare settings.

Submission Guidelines:

The paper should be typed, double-spaced, and submitted electronically in a PDF format through Canvas LMS.
Use APA or MLA citation style for any references, if applicable.
The assignment should be a minimum of three pages.

Be prepared to provide the key aspects of your paper in the in-class discussions in a 5 minute verbal presentation.

Evaluation Criteria:
The assignment will be evaluated based on the following criteria:

Clarity and organization of ideas
Demonstration of understanding of informed consent principles
Effective exploration of challenges in diverse patient populations
Appropriateness and feasibility of proposed solutions
Proper use of citations and references
Overall quality of writing, including grammar and spelling
Participation in class discussions

This assignment aims to deepen your understanding of the ethical and practical considerations involved in obtaining informed consent in healthcare, particularly when dealing with diverse patient populations. If you have any questions or need further clarification, do not hesitate to reach out to me.

Assignment Type

Writing

In-class and/or outside of class

In-class
Outside of class

Formative or Summative

Formative

Assignment

Read chapter 4 in the required textbook by S. Bushong to review the information about electromagnetic energy. Answer the following questions related to the fundamental concepts of x-ray photons. Provide concise and accurate responses.

1. Define the term "frequency" as it relates to an x-ray photon.
2. Express the relationship between frequency and wavelength in an electromagnetic wave. Provide the formula.
3. If the frequency of an X-ray wave is 3 x 10^18 Hz, calculate its corresponding wavelength in meters.
4. Explain the relationship between the energy of an electromagnetic wave and its frequency. How are they related?
5. Explain the relationship between the energy of an electromagnetic wave and its wavelength. How are they related?
6. Explain the relationship between the energy of an electromagnetic wave and its velocity. How are they related?
7. If an X-ray has a frequency of 5 x 10^18 Hz, calculate its energy in electron volts (eV) using the formula E = hf, where h is Planck's constant (4.15 X 10^-15).
8. List the properties and characteristics of x-rays.
9. Fill in the blank: As frequency increases, energy _____.
10. Fill in the blank: As wavelength decreases, velocity _____.

Submission Instructions: Submit your answers in a typed document with your name and date through Canvas LMS. Ensure your responses are clear, concise, and accurate. Each question is worth 1 point. This homework assignment will be discussed in the next class meeting.

Course Materials

Textbooks

1. Bushong, S., (2021) Radiologic Science for Technologists: Physics, Biology, and Protection, 12th Ed., Elsevier. ISBN#: 978-0323661348
2. Ryan, T., (2023) Torres' Patient Care in Imaging Technology , 10th Ed., Wolters Kluwer. ISBN#: 978-1975192518

Class Size Information

Class Size

40

Class Size Category

A - Lecture/discussion 40

Diversity and Inclusion

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

The students will engage in a comprehensive discussion and written analysis focusing on the complexities of securing informed consent from patients from diverse backgrounds, including considerations related to race, culture, and disabilities. This educational endeavor will enable students to deepen their comprehension and competence in patient interaction and communication. They will achieve this by dissecting real-life scenarios drawn from their experiences within the radiology department, where they encountered notable challenges in obtaining informed consent. These challenges encompassed situations involving patients who could not communicate in a shared language, faced gender identity issues, or grappled with issues related to their racial or cultural backgrounds. Through research and discussions with classmates, students will gain valuable insights into navigating these intricacies and developing successful outcomes.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The course employs a variety of instructional methods to cater to diverse learning preferences. These methods encompass lectures, class discussions, and written materials.

Lectures cover a range of topics, including radiation physics, patient care, medical legal issues, and quality control and assurance. These lectures are delivered verbally and complemented by PowerPoint presentations. This approach accommodates both auditory and visual learners, ensuring that the material is accessible to all students.

In-class discussions create an engaging learning environment where students collaborate to explore strategies for obtaining informed consent from a diverse patient population. These instructor-led discussions further reinforce the lecture material, ensuring that students have a solid grasp of the concepts.

Additionally, reading assignments based on textbook chapters focusing on radiation physics, patient care, medical legal issues, and quality control and assurance provide an additional resource. This resource is especially beneficial for students who find visual aids helpful in reinforcing course content.

To gauge students' comprehension and application of these concepts, the course includes tests and exams. These assessments serve as valuable feedback mechanisms, helping students track their progress and providing insights into their understanding of the lecture material.

Interactions

Explain how the course will incorporate student-to-student interaction.

Students will engage in collaborative small group work to review homework assignments, promoting meaningful discussions and interactions among their peers. Additionally, class discussions focused on the assigned paper about informed consent will encourage active participation among students, enabling them to draw from their collective ideas and clinical experiences. This exchange of ideas empowers them to enhance their strategies for addressing patient challenges related to communication and interactions with individuals from diverse backgrounds. Instructor-led discussions in class on the reading assignments will provide students with the opportunity interact with each other and to assess their understanding of the lecture material.

Explain how the course will incorporate instructor-to-student interaction.

Instructors engage with students through in-person lectures, during which students are encouraged to pose questions and seek clarification. Instructors facilitate in-class discussions related to homework assignments, focusing on radiation physics, patient care, and quality control and assurance. Additionally, in class student discussions on medical legal issues such as informed consent will provide student to instructor interaction opportunities to formulate methodologies in dealing with patient challenges. Instructors play a crucial role in offering feedback on exams and tests, especially the difficult radiation physics information, helping to evaluate students' grasp of the course content. Throughout this course, instructors incorporate real-life experience stories, specifically medical legal challenges, into their lectures to enhance student learning. Students, who are actively engaged in clinical training, also contribute their own experiences to these discussions. Instructors actively promote students to make use of office hours or schedule post-class meetings whenever they need additional assistance or guidance.

Explain how the course will incorporate student-to-content interaction.

This course provides a comprehensive textbook that complements the lecture content. Homework assignments offer students the chance to delve into the textbook, reinforcing their understanding of the material and enabling them to retrieve answers to the assignment questions. In addition, students will have access to PowerPoint presentations and supplementary materials via the course management system, such as Canvas. Students will be tasked with conducting research on medical-legal issues, particularly focusing on topics like informed consent.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Students will be afforded the opportunity to reflect on a range of strategies employed for effectively addressing patient challenges when obtaining informed consent. Patients with diverse backgrounds, including differences in race, culture, gender identity, and disabilities, can present unique challenges, requiring a thoughtful approach characterized by respect and empathy to ensure their understanding and consent regarding the risks associated with radiographic procedures. Engaging in these thought-provoking discussions with both peers and the instructor, drawing from their collective experiences, students will acquire the essential skills to bolster their confidence and competence when interacting with patients from all walks of life.

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