

Minnesota State College Southeast

RADT 2650: Radiographic Protection and Biology

A. COURSE DESCRIPTION

Credits: 2

Lecture Hours/Week: 2

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites:

This course requires both of these prerequisites

RADT 2635 - Radiographic Pathology

RADT 2642 - Clinical Practicum 2

Corequisites: None

MnTC Goals: None

This course presents the principles of radiation protection and radiobiology. Topics include an overview of radiation physics, units of measure, radiosensitivity and response, and understanding the radiographers role in utilizing safe radiation practices for patients, personnel, and the public. Radiation health and safety requirements of federal and state regulatory agencies, accreditation agencies, and health care organizations will also be addressed. Specific topics: cell biology in terms of early and late radiation effects; principles of radiation interaction with living systems; radiation effects on biological molecules and organisms; factors affecting biological response; and acute and chronic effects of radiation. (Prerequisites: RADT2541, RADT2635) (2 credits: 2 lecture/0 lab)

B. COURSE EFFECTIVE DATES: 06/16/2009 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Understand principles of radiobiology and the effects/response of radiation exposure
2. Explain responsibilities of the radiographer for patients, personnel, and the public related to radiation protection
3. External Standards:
 1. Introduction
 2. Molecular Bonds
 3. Cell Biology
 4. Types of Ionizing Radiation
 5. Sources of Medical Radiation Exposure
 6. Biophysical Events
 7. Radiation Effects
 8. Radiosensitivity and Response
 9. Structure of the Atom
 10. Nature of Radiation
 11. Interactions of Photons with Matter
 12. Justification for Radiation Protection
 13. Potential Biologic Damage Potential of Ionizing Radiation
 14. Radiation Protection Program
 15. Radiation Sources
 16. Legal/Ethical Responsibilities
 17. Units, Detection & Measurement
 18. Patient Protection

D. LEARNING OUTCOMES (General)

1. Analyze the molecular characteristics and relationships of proton, neutrons, electrons and energy levels of the atom
2. Describe the electromagnetic spectrum and the concept of wavelength and frequency as they relate to velocity and energy
3. Compare natural and man-made sources of ionizing radiation
4. Compare the production of Bremsstrahlung and characteristic radiation and the conditions necessary to produce x-radiation
5. Compare the processes of ionization and excitation
6. Summarize the radiation interactions with matter including radiation energy transfer
7. Contrast the significance of photoelectric effect versus scattering interactions in diagnostic imaging in relation to atomic number, photon energy and part density
8. Apply the different radiation exposure units and quantities as a method of measuring radiation response
9. Summarize the principles of cellular biology and the physical, chemical, and biologic factors influencing radiation response of cells and tissues
10. Categorize between the various effects of radiation exposure by discriminating between direct and indirect ionizing radiation and the mechanisms of radiobiological effects
11. Summarize the effects of radiation exposure to the cell and evaluate factors influencing radiobiologic/biophysical events at the cellular and subcellular level
12. Discuss potential biological damage of ionizing radiation
13. Explain factors influencing radiosensitivity and biological response
14. Examine effects of limited vs. total body exposure
15. Summarize the early and late radiation effects to the cell and human with acute radiation syndrome
16. Relate short-term and long-term effects as a consequence of high and low radiation doses
17. Differentiate between somatic and genetic radiation effects as well as discuss specific diseases or syndromes associated with them
18. Interpret graphic dose-related relationships
19. Discuss stochastic and nonstochastic effects
20. Discuss embryo and fetal effects of radiation exposure
21. Discuss risk estimates for radiation-induced malignancies
22. Outline objectives of a radiation protection program
23. Analyze the application & justification of radiation protection principles for patients and personnel
24. Describe the ALARA concept
25. Identify the appropriate image receptor that will result in an optimum diagnostic image with the minimum radiation exposure to the patient
26. Identify the basis for occupational exposure dose limits (EDL) and compare occupational with non-occupational radiation exposure
27. Discuss legal & ethical responsibilities associated with administration of radiation
28. Analyze radiographic protection principles for the pregnant patient and pregnant imager
29. Describe the requirements for and responsibilities of a radiation safety officer
30. Compare monitoring devices used for the detection of radiation and identify appropriate applications and limitations for each detection device
31. Interpret personnel monitoring reports and compare values for individual effective dose limits for occupational radiation exposures (annual and lifetime)
32. Explain the relationship of exposure factors to patient dosage
33. Summarize the role of surveys, advisory groups and regulatory agencies
34. Summarize standards from NCRP

35. Demonstrate how the operation of various x-ray and ancillary equipment influences radiation safety and describe the potential consequences of equipment failure
36. Distinguish between primary and secondary radiation barriers
37. Identify emergency procedures to be followed during failures of x-ray equipment
38. Explain the relationship of beam-limiting devices to patient radiation protection
39. Explain the purpose and importance of shielding during radiographic examination
40. Apply safety factors for the patient (and others) in the room during routine diagnostic imaging, mobile radiographic procedures, and fluoroscopy

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted