School of Nursing and Health Professions Syllabus

HUDSON COUNTY COMMUNITY COLLEGE

HUDSON is HOME!

Term: **Credits: 4**

Course Code: RAD 102

Title of Course: Radiography II

Days & Times:

Location:

Instructor:

Office Hours:

Office Location:

Email:

Phone:

Prerequisites: RAD 101, RAD 104

Corequisite: RAD 105

COURSE DESCRIPTION:

Content builds upon the foundation of image production identifying the prime components of radiographic image quality and its control. Equipment operation types along with basic QC and QA testing are covered. Radiation protection and biology discuss radiation interaction with atoms and cellular structures. Patient care methodologies are continued emphasizing imaging techniques for mobile, OR and trauma patients. Computer Science principles and digital equipment are introduced including image display, CR, and DR

COURSE OBJECTIVES:

At the end of this course, the student will be able to:

Methods of Patient Care

SLO 1 Infection Control

- Define the terminology related to infection control.
- Categorize the four basic infectious agents along with their unique characteristics.
- Describe the various sources of health care-associated infections.
- Describe the basic premises of standard precautions.

SLO 2 Trauma, Mobile, and Surgical Radiography

- Differentiate among key types of traumatic injuries.
- Demonstrate familiarity with the manipulation and operation of equipment used for trauma, mobile, and surgical radiography.
- Appropriately modify projections and positions to accommodate compromised patient mobility
- Follow the principle of surgical asepsis and radiation protection.

SLO 3 Non-Aseptic Technique

- Describe the insertion, care, and removal of nasogastric tubes.
- Describe the common types of enemas.
- State the need for patient teaching regarding the barium enema—preparation, procedural, and postprocedural.
- State the needs of a colostomy patient undergoing a barium enema.

SLO 4 Medical Emergencies

- Define terms related to medical emergencies.
- List general priorities for working with patients in acute situations.
- Describe the signs and symptoms of various medical emergencies.
- Describe the appropriate procedure for handling patients with various medical emergencies.

SLO 5 Pediatric and Geriatric Radiography

- Identify and discuss different issues when imaging the varying age groups.
- Explain appropriate interaction techniques for patients of varying age groups.

SLO 6 Basic Cardiac Monitoring

- Describe the structural and physiologic mechanisms involved in a complete cardiac cycle.
- Explain the ordered sequence of events in a normal cardiac neural conduction process.

SLO 7 Venipuncture

- Demonstrate accurate vein selection and infection control techniques.
- Perform successful placement of indwelling catheter/butterfly needle on phantom.
- Exposure and Equipment Operations

SLO 8 Density

- Identify density as a prime component of the photographic properties controlling visibility of detail of radiographic image quality.
- Describe the effects of density changes on image appearance.

SLO 9 Contrast

- Identify contrast as a prime component of the photographic properties controlling visibility of detail of image quality.
- Explain the various terms used to describe contrast/dynamic range.
- Define contrast and the factors that affect it.
- Explain how each influencing factor affects contrast.
- Describe the effect of scatter radiation on radiographic contrast.
- Identify methods of scatter reduction.

- Identify the types of grids.
- Explain the types of grid errors.

SLO 10 Recorded Detail

- Define recorded detail, including synonymous terms and derived units.
- Explain the effect of various distances on recorded detail.
- Describe factors that affect penumbra/point spread function size.
- Describe the effect of film/screen combinations on the resolution of recorded detail.
- Discuss the relationship of the three intensifying screen factors to recorded detail.
- Explain digital image receptor factors that control recorded detail.
- Describe appropriate techniques to prevent patient motion.
- Synthesize various geometrical factors into a clinical protocol for improving resolution.
- Recommend techniques for reducing motion, including immobilization devices.

SLO 11 Distortion

- Define size and shape distortion.
- Explain the effects of SID and OID on image distortion.
- Discuss various methods of minimizing distortion through variations of SOD and OID.
- Explain why elongation and foreshortening are relational definitions.
- Describe the routine relationships between central ray, anatomical part and image receptor.
- Explain the proper terms used to describe angulation direction and degree.
- Differentiate distorted images from routine projections.
- Calculate the magnification factor when given SID and SOD.
- Calculate the actual size of an object when given the projected size, SID and OID.
- Describe adjustments of SID, and OID that will minimize magnification.
- Describe adjustments of central ray, anatomical part, and image receptor that will minimize shape distortion.

SLO 22 Automatic exposure control

- Explain the operating principles of automatic exposure control
- Accurately identify configuration size, shape, and position for various brands of ionization chambers.
- Explain the advantages and disadvantages along with the dependence upon proper positioning.
- Describe how to modify image receptor exposure when using an AEC.

SLO 23 General aspects of equipment QA

- Describe the quality control tests and schedule for radiographic systems.
- Explain the importance of testing on ancillary equipment such as IR cleaning and display monitors.

- Discuss the required tests or procedure being performed on x-ray equipment, their frequency and the standards as provided by the State Department on Environmental Protection.
- Computer Science and Digital Imaging

SLO 24 Fluoroscopy

- Describe a typical basic fluoroscopic image chain.
- Explain the difference between the operation of a fluoroscopic and diagnostic x-ray tube.
- Identify, contrast, and compare fixed and mobile units.
- Explain the functions of the image intensification tube input screen, photocathode, electrostatic focusing lenses, and anode and output screen.
- Discuss the effects of minification, flux gain and magnification on total brightness gain and patient doses.
- Differentiate fluoroscopic examinations from static diagnostic radiographic examinations.
- List and describe examinations that will utilize the fixed and mobile fluoroscopy unit.
- Identify the causes of fluoroscopic artifacts.

SLO 25 Tomography

- Define tomography and explain its principles.
- Identify exams that would use auto-tomography.
- Explain amplitude and fulcrum along with their relationship and correlation to section thickness.
- Compare various types of linear, circular, and complex tomographic motions.
- Identify the causes of tomographic artifacts.
- Radiation Protection and Biology

SLO 14 Cell structure, composition, and division

- Describe the various components of the human cell.
- Explain the concept of DNA replication and differentiate between mitosis and meiosis.
- Detail the stages of cell division.

SLO 15 Interaction of x-radiation with matter; early and late effects

- Explain the potential danger to the cell from ionizing radiation.
- List the events that occur when x-radiation passes through matter.
- Discuss the probability of photon interaction with matter.
- Describe and illustrate by diagram the x-ray photon interactions with matter that are important in diagnostic radiology.
- Describe the impact of contrast media on photoelectric absorption, and its effects on absorbed dose.
- Differentiate between direct and indirect radiation effects
- Explain target theory

- Differentiate between somatic, genetic, acute and late radiation effects.

SLO 16 Molecular & cellular radiation biology; acute radiation syndrome

- List three radiation energy transfer determinants and explain their individual concepts.
- Differentiate among the three levels of biological damage (ARS) that may occur in living systems because of exposure to ionizing radiation and describe how the process of direct and indirect action of ionizing radiation on the molecular structure of living systems occurs.
- Explain and discuss the target theory
- Describe the process of ionization of organic molecules (radiolysis of water).
- Give examples of free radicals
- Explain linear energy transfer and relative biological effectiveness.
- Give examples of free radicals

SLO 17 Stochastic vs. nonstochastic responses; Radiation emergencies; Rad Organizations

- List the factors that affect cell radiosensitivity.
- State and describe the law of Bergonie and Tribondeau.
- Describe the process of absorption, and explain the reason why absorbed dose in atoms of biological matter should be kept as small as possible.
- Explain current protection philosophy on the basis of the dose response curves.
- Identify the different agencies involved in governing and specifying dose limits and protection practices.
- Identify radiation emergencies and actions to be taken during such events.
- List and describe the function of the four major organizations that share the responsibility for evaluation the relationship radiation equivalent dose and induced biologic effects and five U.S. regulatory agencies responsible for enforcing established radiation effective dose limiting standards.
- Explain the function of the Radiation Safety Committee in a medical facility, and describe the role of the Radiation Safety Officer by list the various responsibilities he/she must fulfill.
- Explain the purpose of the Radiation Control for Health and Safety Act of 1968 and the
- Consumer Patient Health and Safety Act of 1981.
- Discuss the National Council on Radiation Protection and Measurements recommendations.

Physics

SLO 18 X-photon production elements

- Discuss conditions necessary to produce x-radiation.
- Describe the movement of current through the x-ray circuitry to the tube.
- Discuss the interactions between the projectile electrons and the x-ray tube target.

- Discuss the way x-rays are produced and explain the range of energies present in the x-ray beam.
- Identity Characteristic and Bremsstrahlung x-rays
- Discuss similarities and difference in each type of radiation production with regards to photon energy.

SLO 19 Factors affecting x-ray emission

- Describe the x-ray emission spectrum.
- Explain how mAs, kVp, added filtration, target material, and voltage ripple affect the xray emission spectrum.
- Draw how mAs, kVp, added filtration, target material, and voltage ripple affect the x-rayemission spectrum.

SLO 20 Electric power; general/series circuits; magnetism & Faraday laws

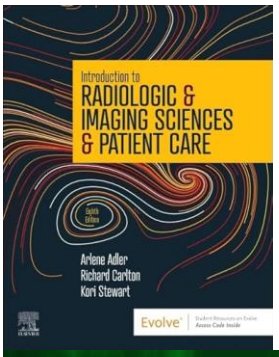
- Identify basic circuit components in a radiographic machine schematic.
- Calculate voltage, amperage and resistance in simple series and parallel circuits.
- Discuss Faraday's Laws and their effect on induction and transformers.

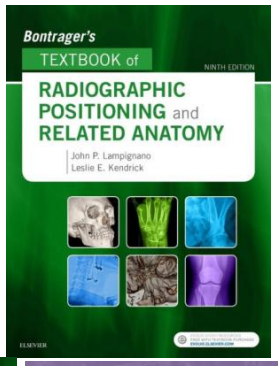
SLO 21 Transformers

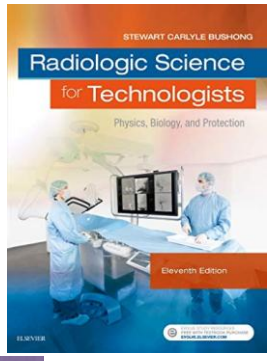
- Describe the function of a transformer.
- Discuss the types of transformer loss.
- Calculate voltage and amperage according to the transformer law

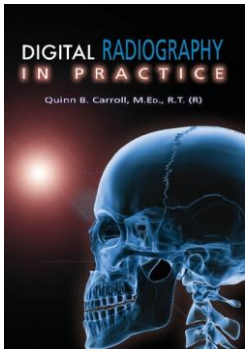
TEXTBOOK REQUIRED:

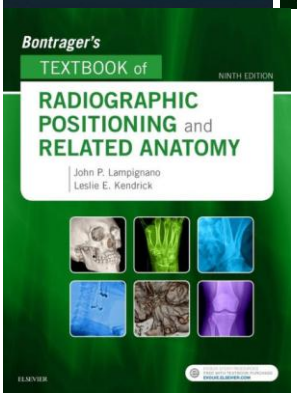
- Adler, A. | Carlton, R. (2016) Intro to Radiologic Imaging Sciences & Patient Care, 6th ed.
- Bontrager, Lampignano, (2017), Textbook of Radiographic Positioning and Anatomy, 9th ed.
- Bushong, S., (2017), Radiologic Science for Technologists: Physics, Biology, and Protection, 11th ed.
- Carroll, (2019), Digital Radiography in Practice 1st ed.
- Lampignano & Kendrick (2017) Workbook for Textbook of Radiographic Positioning and Related Anatomy, 9th ed.
- Orth, D., (2017) Essentials of Radiologic Imaging, 2nd ed
- Statkiewicz-Sherer, M., (2018), Radiation Protection in Medical Radiography, 8th ed.
RadTechBootCamp, CloverLeaf learning platform

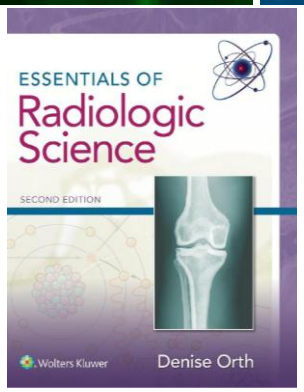












EVALUATION METHODS:

- Test grades 60%
- Final exam 20%
- Quiz/homework/writing component 10%
- Rad Tech Bootcamp/Tech homework 10%
- Total 100%

WEEKLY OUTLINE:

Week	Topic	Learning Outcomes (L.O)
1	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 1**
2	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 2**
3	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 3**
4	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 4**

5	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 5**
6	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 6**
7	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 7**
8	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 8**
9	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 9**
10	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 10**
11	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 11**
12	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 12**
13	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 13**
14	**Methods of Pt. Care, Exposure & Equipment Operations, Radiation Physics**	**SLO 14**
15	**Final Paperwork**	**Final Paperwork**

HCCC POLICIES, STATEMENTS, AND SERVICES:

https://www.hccc.edu/administration/academic-affairs/syllabus-addendum.html