School of Nursing and Health Professions Syllabus

HUDSON COUNTY COMMUNITY COLLEGE
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Term: **Credit: 4 CR** **Office Hours:**

Course Code: RAD 204 **Office Location:**

Title of Course: Radiography IV **Email:**

Days & Times: **Phone:**

Location: **Prerequisites/ Corequisites: RAD 101, 102, 103, 104, 105, & Co-Req RAD 207**

Instructor:

COURSE DESCRIPTION:

Advanced principles of digital radiography along with introduction to digital peripheral equipment will be discussed. Digital equipment for fluoroscopy imaging is taught. Quality Management including continuous quality improvement and quality assurance is covered. Radiographic Pathology introduces the concepts of diseases and etiology related to radiographic imaging. Students will create and present a verbal Critical Thinking radiographic analysis project affirming their understanding of image production, equipment, evaluation, and pathology.

STUDENT LEARNING OUTCOMES:

1. Advanced Digital Imaging

SLO 1: Introduction to Digital Radiography and PACS

- Define the term digital imaging.
- Explain latent' image formation for conventional film/screen radiography.
- Compare and contrast the latent image formation process for storage phosphor, flat panel
- with thin-film transistor (TFT), and charge-coupled device (CCD) digital imaging systems.
- Explain what a picture archiving and communication system (PACS) is and how it is used.
- Define digital imaging and communications in medicine (DICOM).

SLO 2: Digital Imaging Characteristics

- Differentiate between analog and digital images.
- Define pixel and i1nage matrix and characteristics of each,

- Relate pixel size, matrix size, and field of view (POV) to each other. Discri1ninate between standard units of 1neasure for exposure indicators. Define image brightness.
- Discuss the differences between spatial resolution and contrast resolution. Discuss the implications of image noise, modulation transfer function, and detective quantum efficiency (DQE).
- Define exposure latitude.

SLO 3: Digital Radiographic Image Processing and Manipulation

- Describe the formation of an image histogram.
- Discuss automatic rescaling.
- Compare image latitude in digital imaging with film/screen radiography.
- List the functions of contrast enhancement parameters.
- State the Nyquist theorem.
- Describe the effects of improper algorithm application.
- Discuss the purpose and function of image manipulation factors.
- Describe the major factors in image management.

SLO 4: Photostimulable Phosphor Image Capture

- Describe the basic construction of a photostimulable phosphor (PSP) cassette and imaging plate.
- Describe the purpose of each layer of the imaging plate.
- Explain the process of photostimulation in the imaging plate.
- Explain the process of reading and erasing the imaging plate.
- Compare conventional radiographic screen and film speed to PSP systems. Discuss the importance of matching the body part being examined to the examination menu.
- Discuss the selection of technical factors for density, contrast, and penetration.
- Describe the imaging plate and grid selection process.
- Discuss the importance of preprocessing colli1nation and image marking, Compare exposure indicators for the major computed radiography manufacturers and vendors.

SLO 5: TFT Flat-Panel Array Image Acquisition

- Define a thin-film transistor (TFT) flat-panel digital image detector.
- Describe the construction of direct and indirect TFT flat-panel detector systems.
- Differentiate between direct and indirect image capture.
- Describe a gadolinium oxysulfide (Gd_2O_2S) detector.
- Describe a thallium doped cesium iodide (Csl[TI]) detector.
- Relate the design of a TFT flat-panel detector to its performance measurements.
- Describe the cause of i1nage lag and the process of correcting.

SLO 6: CCD/CMOS Image Capture

- Describe the components of a charge-coupled device (CCD).

- Explain the function of a CCD.
- Define complementary metal oxide semiconductor (CMOS).
- Describe the basic construction and function of a CMOS.
- Differentiate between CCD and CMOS technology.

SLO 7: Digital Fluoroscopy Principles

- Identify the components of a digital fluoroscopic unit and explain their function.
- Describe the theories and principals involved in digital fluoroscopy
- Describe brightness control of fluoroscopic images
- Describe methods for monitoring fluoroscopic images
- Describe basic methods of obtaining digital fluoroscopic images
- Describe QC procedures for evaluating digital fluoroscopy.

SLO 8: PACS Fundamentals

- Define picture archiving and communication system (PACS).
- Compare and contrast the various types of PACS display workstations. Differentiate among the different types of digital imaging work flow.
- Define system architecture and recognize the three major models. Summarize the common functions found on a PACS workstation.
- Describe the situations and users that may require advanced PACS workstation functions.

SLO 9: PACS Archiving and Peripherals

- Describe the use of an image archive in terms of short- and long-term storage. Explain the function of the image manager.
- Compare and contrast the various long-term archive technologies used in current picture archiving and communication systems.
- Define the concept of an· application service provider.
- Explain the differences between laser film digitizers and charge-coupled device (CCD) film digitizers.
- Compare and contrast dry laser imager technology with wet laser imager technology.
- Discuss the common uses for imagers in a picture archiving and communication system (PACS) environment.
- Identify common uses for compact disk (CD)/digital versatile disk (DVD) burners in a PACS environment.

SLO 10: Ensuring Quality in PACSs

- Describe the differences between quality control (QC) and quality assurance activities.
- Define continuous quality improvement (CQI) and its uses in a radiology department.
- Describe the daily and monthly/quarterly QC monitoring activities.
- Discuss the process of daily/weekly QC on laser imagers.
- State the common QC activities used to measure system speed and data integrity.

- Describe several quality assurance (QA) activities used in a digital radiology department.

SLO 11: Quality Acceptance Testing within Digital Projection Imaging

- Discuss total quality management and its uses in digital projection imaging.
- Describe the daily, weekly, and monthly quality control (QC) activities assigned to a radiologic technologist.
- Explain the importance of establishing a repeat analysis database with digital projection imaging.
- State the common QC activities performed by a service engineer on digital projection imaging equipment.
- Become familiar with problem reporting responsibilities.
- Recognize the quality management (QM) and QC activities to be performed by the radiation physicist.
- Acknowledge personal responsibilities for correctly marking images, maintaining personal repeat rates, and artifact prevention.

2. Pathology:

SLO9: Introduction to Pathology

- Define common terminology associated with the study of disease.
- Differentiate between signs and symptoms.
- Distinguish between disease diagnosis and prognosis.
- Describe the different types of disease classifications.
- Cite characteristics that distinguish benign from malignant neoplasms.
- Describe the system used to stage malignant tumors.
- Identify the difference in origin of carcinoma and sarcoma.

SLO10: Skeletal System

- Describe the anatomic components of the skeletal system on a macroscopic level and basic microscopic level.
- Identify and explain the criteria for assessing technical adequacy of skeletal radiographs.
- Characterize a given condition as congenital, inflammatory, arthritic, or neoplastic.
- Specify the pathogenesis, signs and symptoms, and prognosis of the skeletal pathologies cited in this chapter.
- Explain the role of various imaging modalities In the diagnosis and treatment of skeletal pathologies.

SLO11: Abdomen and Gastrointestinal System

- Describe the anatomic components of the abdomen and the gastrointestinal system and how they are visualized radiographically.

- Compare and contrast the various imaging modalities used in the evaluation of the abdomen and gastrointestinal system.
- Identify the tubes and catheters related to the gastrointestinal system by type, and explain their use.
- Characterize a given condition as congenital, inflammatory, neurogenic, or neoplastic.
- Identify the pathogenesis of the gastrointestinal diseases cited and typical treatments forthem.
- Describe, in general, the radiographic appearance of each of the given pathologies.
- Understand which imaging modalities foster the diagnosis of the cited abdominal and gastrointestinal pathologies.

SLO12: Urinary System

- Describe the anatomic components of the urinary system and their functions.
- Discuss the role of other modalities in imaging the urinary system, particularly sonography and computed tomography.
- Discuss common congenital anomalies of the urinary system.
- Characterize a given condition as inflammatory or neoplastic.
- Identify the pathogenesis of the diseases cited and the typical treatments for each.
- Describe, in general, the radiographic appearance of each of the given pathologies.

SLO13: Respiratory System

- Describe the anatomic components of the respiratory system.
- Describe the various types of tubes, vascular access lines, and catheters used in relation to the respiratory system.
- Characterize a given condition as congenital, inflammatory, or neoplastic.
- Identify the pathogenesis of the chest pathologies cited and the typical treatments for them.
- Describe, in general, the radiographic appearance of each of the given pathologies.

SLO14: Hepatobiliary System

- Describe the anatomic components of the hepatobiliary system and state how they are visualized radiographically.
- Discuss the role of other imaging modalities in the imaging of the hepatobiliary system, particularly sonography, magnetic resonance imaging, and computed tomography.
- Characterize a given condition as inflammatory or neoplastic.
- Identify the pathogenesis of the diseases cited and the typical treatments for each.
- Describe, in general, t e radiographic appearance of each of the given pathologies.

SLO15: Cardiovascular System

- Describe the anatomic components of the cardiovascular system.

- Explain the appearance of the various portions of the heart on conventional chest radiographs.
- Describe each segment of the cardiac cycle.
- Discuss the role of other imaging modalities in the diagnosis, treatment, and management of cardiovascular disorders.
- Differentiate among the major congenital anomalies of the cardiovascular system.
- Identify the pathogenesis of the diseases cited and the typical treatment(s) for each.
- Describe, in general, the radiographic appearance of each of the given pathologies.

SLO16: Central Nervous System

- Describe the anatomic components of the central nervous system and their general function.
- Discuss the roles of the various imaging modalities in evaluation of the central nervous system, particularly magnetic resonance imaging and computed tomography.
- Discuss common congenital anomalies of the central nervous system.
- Characterize a given condition as inflammatory, degenerative, vascular, or neoplastic.
- Identify the pathogenesis of the diseases cited and the typical treatments for each.
- Discuss the imaging modalities most commonly used for each type of central nervous system pathology discussed in this chapter.
- Describe, in general, the radiographic appearance of each of the given pathologies.

SLO17: Reproductive System

- Discuss the basic anatomic structures associated with the male and female reproductive systems.
- Briefly explain the role of general radiography, mammography, diagnostic medical sonography, computed tomography, and magnetic resonance imaging in the diagnosis and treatment of reproductive system disorders.
- Compare and contrast breast imaging modalities, including diagnostic versus screening mammography, localization techniques, and sonography.
- Differentiate among the major congenital anomalies of the female reproductive system.
- Describe the various neoplastic diseases of both the female and male reproductive systems in terms of etiology, incidence, signs and symptoms, treatment, and prognosis.
- Differentiate among the common disorders during pregnancy and explain the role of diagnostic medical sonography in the management of the gravid female.

SLO18: Endocrine System

- Describe the anatomic components and function of the endocrine system.
- Identify and explain the various imaging modalities used in diagnosing and treating endocrine disorders.
- Specify the disorders, signs and symptoms, and prognosis of the endocrine pathologies discussed in this chapter.

3. Critical Thinking Project/Pathology:

SLO 19: Student will create and present a verbal Critical Thinking radiographic analysis project incorporating their learned subject matter.

Lab/Clinical:

First Step: Lab demonstration class is mandatory and is completed in the non-energized lab room on campus before the Didactic portion of the imaging studies.

Second Step: Lab Evaluations are performed by students who have successfully passed the didactic component of the imaging study. School faculty observe and grade the student on lab evaluations. Date of performed lab is documented on Student's Individual CCE record. Passing grade on lab evaluations is 85% and must be completed before student moves onto Performance of Patient Procedure phase.

Third Step: Patient Performance Phase: *Students must perform One Patient Procedure (non-graded) under Direct Supervision Prior to performing a (graded) ICCE. Students must document and have signed by a licensed R.T. (staff radiographer) on their Student Individual CCE record that they have performed the radiographic study.* The student can perform the study immediately after passing the lab evaluation, once the study becomes available in the department.

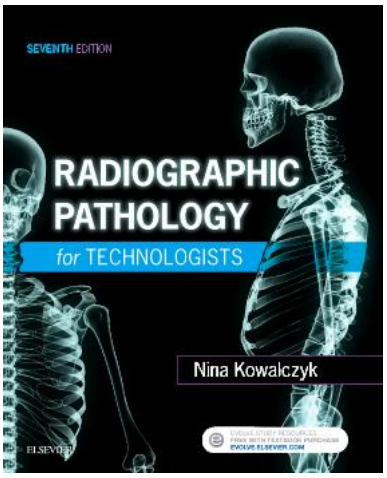
Fourth Step: Initial Clinical Competency Evaluations: B 4- I A (Handbook) One week time frame between Lab and Competency must pass before the student can be evaluated on the competency evaluation unless the faculty C.I. approves it earlier for an unusual case. **Only faculty or designated clinical instructors can evaluate and grade the student's CCE.**

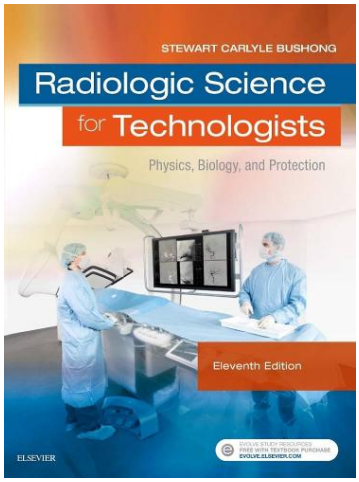
TEXTBOOK REQUIRED:

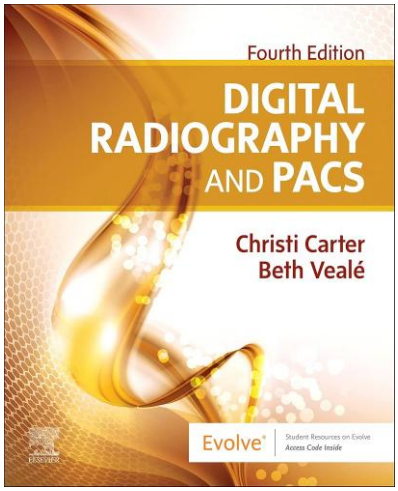
Carter, C. | Veale, B. (2013) Digital Radiography and PACS, 2nd ed. Bushong, S., (2017),

Radiologic Science for Technologists: Physics, Biology, and Protection, 11th ed.| Orth, D. (2017)

Essentials of Radiologic Science, 2nd. ed. Kowalczyk, N., (2014) Radiographic Pathology for Technologists, 7th ed. ASRT Radiation Protection article provided







EVALUATION METHODS:

- # of unit section averages = 70% of final grade
- Final Exam = 30% of final grade
- Total = 100% for final grade of subject

WEEKLY OUTLINE:

Week	Topic	Learning Outcomes (L.O)
1	Intro to Pathology; Skeletal System	SLO 9, 10, 19
2	Abdomen and Gastrointestinal System	SLO 11, 19
3	Abdomen and Gastrointestinal System	SLO 11
4	Urinary System	SLO 12
5	Respiratory System	SLO 13
6	Mentor Day	Mentor Day
7	Hepatobiliary System	SLO 14
8	Cardiovascular System	SLO 15
9	Central Nervous System	SLO 16
10	Mentor Day	Mentor Day
11	Reproductive System; Endocrine System	SLO 17, 18, 19
12-14	Review Weeks & Presentation	Review Weeks & Presentation
15	Final Exam	FINAL

HCCC POLICIES, STATEMENTS, AND SERVICES:

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