Course Acronym:	RTEC
Course Number:	255
Descriptive Title:	Advanced Imaging and Special Procedures
Division:	Health Sciences and Athletics
Department:	Radiologic Technology
Course Disciplines:	Radiologic Technology
Catalog Description:	This course is designed for the advanced radiography student. Emphasis is placed on anatomy, pathology, positioning and patient care for specialized radiographic procedures. Newer imaging modalities are explored, along with cross sectional anatomy. Advanced modalities such as CT, MRI, Nuclear Medicine, PET, Ultrasound and Radiation Therapy are covered. An in-depth exploration of digital imaging, fluoroscopy and radiation safety principles are also reviewed.
Prerequisite:	Radiologic Technology 233 and Radiologic Technology 244 and Radiologic Technology 217 with a minimum grade of C in prerequisite
Co-requisite:	Radiologic Technology 218
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	4
Hours Laboratory (per week):	0
Outside Study Hours:	8
Total Course Hours:	72
Course Units:	4
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	3/15/1999
Transfer UC:	No
Effective Date:	
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	
Term:	

Other:	
Student Learning Outcomes:	**SLO #1 Radiographic Special Procedures** Students will analyze Radiographic Special Procedures and new trends in imaging modalities. Students will be able to research, write and give and oral presentation on a topic relating to "Special Imaging Modality" and new trends in imaging. **SLO #2 Communication Skills:** Students will demonstrate effective communication skills related to the imaging modalities and equipment used for Radiographic Special Procedures. **SLO #3 Radiographic Quality Assurance:** Students will describe the purpose of Radiographic Quality Assurance and Quality Control and relate how it affects patient care.
Course Objectives:	1. Identify and describe the types of equipment used for specialized radiographic, interventional and other imaging procedures. 2. Compare interventional and other special procedures for the types of imaging modality equipment, contrast media, accessory equipment, patient positioning and imaging protocols used for each type. 3. Identify the different types of contrast media used for specialized radiographic procedures and list the indications and contraindications for the use of each. Research current uses in medical imaging departments. 4. Accurately identify radiographic anatomy, cross sectional anatomy, patient positioning exam protocols, and related pathology associated with special radiographic procedures. 5. List and describe the means of protecting the patient and staff during special radiographic procedures. 6. Identify hardware and software of CT (computerized tomography) and MR (magnetic resonance) imaging system. 7. Differentiate between CT and MR in regards to techniques and processes involved in image reconstruction. 8. Discuss the origin and theory and design of CT, MRI, Nuclear Medicine, Position Emission Tomography (PET), and Ultrasonography imaging modalities. 9. Identify and label anatomy of the head, thorax, abdomen and pelvis, and review associated pathology from cross sectional diagrams and images for CT, MRI, Nuclear Medicine, PET and Ultrasound. 10. Review and explore the principles of digital imaging for cassette based and cassette-less systems to include; receptors and detectors, image acquisition, radiation response and indicators, detective quantum efficiency (DQE), image extraction and scatter control. 11. Explore digital image acquisition and raw data analysis, histogram analysis and errors, field recognition errors, contrast and signal to noise ratios, recognize factors that influence image detail, clarity and artifacts. 12. Discuss computer software for digital imaging, automatic rescaling and post processing functions and proper grid use. 13. Compare and contrast image display and types of viewing monitors as compared to film/screen, picture archiving and communication systems, teleradiology, and operator responsibilities such as image annotation and manipulation, and patient confidentiality. 14. Analyze quality assurance, quality control and preventative maintenance procedures for radiography, fluoroscopy, and digital image addressing; initial acceptance testing, cassette-based plate maintenance, uniformity of default processing codes, and reject analysis. Discuss exposure factors and exposure myths associated with digital imaging systems and methods of controlling patient exposure, monitoring patient exposure, while improving image quality.

	15. Analyze experiments that demonstrate quality control testing of fluoroscopic and digital equipment and discuss results. 16. Research new imaging modalities and procedures for special procedures.
Major Topics:	**I. Special Imaging and Interventional Equipment (2 hours, lecture)** A. Automatic injectors B. Contrast Media 1. types and classification 2. route for contrast injection 3. indications and contraindications 4. needles 5. Catheters **II. Special Imaging Procedures (24 hours, lecture)** A. Patient positioning B. Imaging Procedures 1. Arthrography 2. Sialography 3. Central Nervous System Exams a. Myelography b. Bone Densitometry c. Kyphoplasty d. Vertebralplasty C. Nonvasular Interventional Procedures D. Reproductive organ imaging 1. Hysterosalpingography 2. Mammography 3. Prostate E. Angiography 1. Arteriography 2. Cardiography 3. Venography F. New imaging modalities **III. California Department of Public Health (CDPH) Radiation Health Regulations (4 hours, lecture)** A. Radiation Safety Practices 1. Patients 2. Students 3. Other personnel B. Title 17 Regulations 1. 10 CRF 20 C. RHB- Radiation Protection Syllabus **IV. Principles of Conventional and Digital Fluoroscopy (10 hours, lecture)** A. Radiation Safety B. Equipment Design 1. Image intensifiers 2. Flat Panel Detectors (FPD),Charged Coupled Device (CCD) and Thin Film Transistors (TFT) 3. Fluoroscopy image recording devices 4. Television cameras and monitors 5. Closed circuit systems C. Bi-Plane Special Procedures equipment D. Mobile c-arm fluoroscopy equipment and safety E. Cineradiography

	1. Patient radiation dose 2. Safety considerations **V. Digital Imaging Systems (12 hours, lecture)** A. Radiographic and Fluoroscopy 1. Exposure factors and exposure myths a. Look up tables (LUT) b. Gray scale analysis c. Contrast to noise ratio (CNR) d. Signal to noise ratios (SNR) 2. Cassette based and cassette-less systems a. Receptors and detectors b. Image acquisition c. Raw data analysis d. Detector quantum efficiency (DQE) e. Scatter control f. Image extraction 3. Image analysis for contrast, density and brightness a. Window leveling and width b. Image detail and clarity c. Image artifacts 4. Histogram analysis and errors a. Field recognition errors 5. Grid usage and type B. Computer software for digital imaging C. Automatic rescaling and Post-processing D. Radiation response and exposure indicators 1. Controlling and monitoring patient exposure **VI. Quality assurance, quality control testing (4 hours, lecture)** A. Radiography, fluoroscopy and digital imaging B. Preventative maintenance procedures C. Initial acceptance testing D. Cassette-based plate maintenance E. Uniformity of default processing codes F. Reject analysis **VII. Other Imaging Modalities Fundamentals (4 hours, lecture)** A. Origin and Theory B. Hardware and Software C. Image Reconstruction 1. Computed tomography (CT) 2. Magnetic Resonance (MR) 3. Ultrasonography (US) 4. Nuclear Medicine (NM) 5. Position Emission Tomography (PET) a. Fusion and Molecular Imaging **VIII. Cross sectional and 3-D Imaging (12 hours, lecture)** A. Anatomy, physiology and pathology B. Image review using CT, MRI, PET, NM, US 1. Head 2. Thorax 3. Abdomen 4. Pelvis C. Other special imaging modalities
Total Lecture Hours:	72

Total Laboratory Hours:	0
Total Hours:	72
Primary Method of Evaluation:	1) Substantial writing assignments
Typical Assignment Using Primary Method of Evaluation:	Research a special procedure or modality in medical imaging and write a five-to seven page report using APA or MLA format. Give a ten- to fifteen-minute oral presentation to the class on your subject using visual aids and other multi-media such as a Power Point presentation. Images of the modality must be included in the oral presentation.
Critical Thinking Assignment 1:	Compare the danger, cost, and diagnostic appropriateness of CT, MR, and conventional radiography in evaluation of the: Brain and Spinal Cord, Abdomen, Skeletal system and Chest. Write a two-page report on your findings. Compare and contrast your results with other students in your group, then give an in class oral presentation of your summary.
Critical Thinking Assignment 2:	Analyze and compare results of laboratory experiments performed with fluoroscopy equipment and phantoms to assess quality control testing of equipment, radiation protection and digital imaging equipment. Give an oral presentation of your results to the class.
Other Evaluation Methods:	Class Performance, Completion, Fieldwork, Homework Problems, Multiple Choice, Presentation, Term or Other Papers, True/False
Instructional Methods:	Demonstration, Group Activities, Guest Speakers, Lecture, Multimedia presentations
If other:	Internet Presentation/Resources Supervised laboratory experiments at clinical affiliates using fluoroscopy and various digital systems. Must be directly supervised by a Radiologic Technologist (RT)
Work Outside of Class:	Answer questions, Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting), Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	Supervised fluoroscopy and digital lab assignments performed at clinical affiliates under direct supervision of a Radiologic Technologist (RT).
Up-To-Date Representative Texts:	***Merrill's Radiographic Positioning & Procedures*** (VOL 1& 2) Long et all, 15th Ed. Elsevier 2022 Workbook: *Radiographic Anatomy, Positioning & Procedures Workbook* Long et all 15th Ed. Elsevier 2022 Principles of Radiographic Imaging, by Carlton 6th ed & Carlton's Workbook *Radiation Protection In Medical Radiography* 8th ed. by Statkiewicz et all 2022 *Digital Imaging & Pacs* by Carter & Vealé, 2023 4th Edition *Comprehensive Radiographic Pathology* by Eisenberg and Johnson, 7th Edition, Elsevier, 2020. Workbook: *Comprehensive Radiographic Pathology* by Eisenberg and Johnson, 7th Edition, Elsevier, 2020.
Alternative Texts:	
Required Supplementary Readings:	Excerpts from Title 17; Department of Health Services, State of California, 2022.
Other Required Materials:	Journals and other Radiologic Technology Periodicals: A. Radiologic Technology, American Society of Radiologic Technologists (ASRT) B. ASRT Scanner

Requisite:	
Category:	
Requisite course(s): List both prerequisites and corequisites in this box.	**Prerequisite:** Radiologic Technology-233 AND Radiologic Technology-244 AND Radiologic Technology-217 **Corequisite:** Radiologic Technology-218
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Differentiate the types of contrast media used for specialized radiographic procedures and list the indications and contraindications for the use of each.** RTEC 218 - Compare and contrast the precautions, use and handling associated with contrast agents. RTEC 233 - Compare and contrast the indications, contraindications, and associated complications with the use of each type of contrast media. **Differentiate between the types of contrast media used for specialized radiographic procedures of the cranium and central nervous systems.** RTEC 233 - Compare and contrast the indications, contraindications, and associated complications with the use of each type of contrast media. **Demonstrate ways to protect the patient, self and others from excessive radiation exposure during special radiographic procedures.** RTEC 217 - Demonstrate competency in the principles of radiation protections standards. RTEC 218 - Select technical factors to produce quality diagnostic images with the lowest radiation exposure possible. RTEC 244 - Compare the levels of radiation exposure to patient and operator from various types of radiographic equipment. RTEC 244 - Identify the radiation protection and shielding requirements for basic fluoroscope procedures. **Describe the necessary patient positioning required to perform various advanced imaging procedures.** RTEC 218 - Assist and perform radiographic examinations of all areas, including special procedures, under the appropriate level of supervision in all aspects. RTEC 233 - Demonstrate positioning skills for each unit of instruction. RTEC 217 - Assist and perform radiographic examinations of all areas, excluding special procedures, under the appropriate level of supervision in all aspects. RTEC 218 - Evaluate the patient's status and condition before, during and following the radiologic procedure. RTEC 233 - Describe the advantages of specialized imaging modalities which include Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine Scans, and Sonography for imaging of the cranium and central nervous system.
Requisite Skill:	
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding	

course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Donald Visintainer
Date:	01/01/1974
Original Board Approval Date:	02/17/2016
Last Reviewed and/or Revised by:	Dawn Charman
Date:	02/14/2024
Last Board Approval Date:	05/20/2024
Effective Term:	FALL 2025