

JEFFERSON COLLEGE
COURSE SYLLABUS

RAD250

Computed Tomography Registry Review Course

3 Credit Hours

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I. CATALOGUE DESCRIPTION

- A. Prerequisites: Registered Radiologic Technologist through the American Registry of Radiologic Technologists (ARRT) or second year Radiologic Technology student in their final semester of an accredited program.
- B. Credit hour award: 3
- C. Description: This course is designed to provide an ARRT Registered Radiologic Technologist the structured educational requirements needed to be eligible to take their ARRT post-secondary Computed Tomography (CT) registry. Each of the four content areas for the ARRT exam will be covered, including: patient care, safety, image production, and procedures. (S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Expected Learning Outcomes	Assessment Measures
Identify and describe generational scanners as well as components of a CT imaging system	Written Assignments Class Discussion Written Examinations
Discuss general radiation safety and protection practices as well as identify radiation protection guidelines and dose management for adult and pediatric patients	Class Discussion/Activity Written Examinations Written Assignments
Understand the different types of contrast media utilized; identify adverse reactions and treatment procedures	Class Discussion/Activity Written Examinations Written Assignments
Describe patient assessment, monitoring, as well as evaluate lab values and medications important in medical imaging	Class Discussion/Activity Written Examinations Written Assignments

Understand radiation physics	Class Discussion/Activity Written Examinations Written Assignments
Identify plane, position and pathology for the cranium, neck, chest, abdomen, pelvis and MSK	Class Discussion/Activity Written Examinations Written Assignments

II. OUTLINE OF TOPICS

A. History of CT

1. Historical perspective beginning 1895
 - i. Roentgen, Cormack, Hounsfield, Radon
 - ii. Timeline from X-ray discovery to Multi-slice computed tomography (MSCT) discovery
2. Conventional tomography over radiography
3. Generations of scanners and operational modes
 - i. First generation
 - ii. Second generation
 - iii. Third generation
 - iv. Fourth generation
 - v. Electron beam CT (EBCT)
 - vi. Spiral CT

B. Patient Care

1. Clinical History
2. Scheduling and screening
3. Exam education
 - i. Risk verses benefits
 - ii. Other options
 - iii. Side effects
 - iv. Pre and posttest directions
4. Consent
 - i. Informed consent
 - ii. Implied consent
5. Immobilization techniques
 - i. Breath hold
 - ii. Manufacturer sponges and straps
6. Patient assessment and monitoring
 - i. Obtaining accurate history
 - ii. Documentation of medical history, illnesses, procedures, allergies
 - iii. Lab values- BUN, Creatinine, PT, PTT, GFR, D-Dimer, INR
 - iv. Vitals- temperature, pulse, blood pressure, cardiac cycles, respirations

- v. Medications- metformin, Coumadin, steroids, anti-anxiety, gating
- vi. Post procedure instructions- diabetic patients, biopsy, myelography

C. Contrast Administration

1. Venipuncture
 - i. Aseptic technique
 - ii. Sterile technique
 - iii. Site selection
 - iv. Needle types gauge
 - v. Documentation
2. Injection Techniques
 - i. Manual verses power injectors
 - ii. Types of injectors
 - iii. Extravasation
3. Contrast agents and dosing
 - i. Positive
 - ii. Negative
 - iii. Neutral
 - iv. Intravenous (IV) contrast media
 - v. Enteral- barium and water soluble
 - vi. Intrathecal
 - vii. PICC lines, Central lines, Ports, Stoma
 - viii. Ionic verses nonionic
 - ix. Osmolar, non osmolar, low osmolar
 - x. American College of Radiography (ACR) Four H's of Contrast Administration
4. Special Considerations
 - i. Premedication
 - ii. Chronic renal failure verses acute renal failure
 - iii. Pregnancy and nursing
 - iv. High risk for adverse reactions
 - v. Recognition and assessment of adverse reactions
5. Adverse reactions
 - i. Mild
 - ii. Moderate
 - iii. Severe
 - iv. Delayed
6. Treatments, follow up and documentation

D. Radiation Safety

1. System configurations and user settings
2. Technical factors
 - i. Kilovoltage peak (kVp) and mille-ampereage per second (mAs)
 - ii. pitch

- iii. Collimation
- iv. Multidetectors
- 3. Protection
 - i. As low as reasonably achievable (ALARA)
 - ii. Shielding
 - iii. Reduced scan lengths
 - iv. Strict clinical indication
 - v. Protocol optimization
- 4. Dose Measurement and reduction
 - i. Over-ranging
 - ii. Overbeaming
 - iii. Adaptive Section
 - iv. Focal spot size
 - v. CT dose index (CTDI)
 - a. $CTDI_{100}$
 - b. $CTDI_w$
 - c. $CTDI_{vol}$
 - vi. Dose length procedure (DLP)
 - vii. Multi scan average dose (MSAD)
 - viii. Pediatric patient
 - a. Image Gently campaign
 - b. Image Wisely
 - c. Society for Pediatric Radiography (SPR) recommendations
 - d. Dose reduction guidelines
 - e. SMART mA
 - f. Automatic exposure control (AEC) CT
 - ix. Iterative reconstructions
- E. Image Production
 - 1. CT System
 - i. Tube- technical factors
 - ii. Generator types
 - iii. Detector configurations
 - iv. Data acquisition system (DAS)
 - v. Collimation, filters and algorithms
 - vi. Computer and storage
 - 2. Image Display
 - i. Pixels, voxels, matrix
 - ii. Scanned field of view (FOV)
 - i. Window level and window width
 - ii. Region of interest (ROI) and Hounsfield units (HU) measurements
 - 3. Reconstructions
 - i. Planes
 - a. Sagittal

- b. Transverse
 - c. Axial
 - d. Coronal
 - ii. Filter back projection
 - iii. Iterative reconstructions
 - iv. Interpolation
 - v. Algorithms
 - vi. Digital to analog
- 4. Post-processing
 - i. Multiplanar Reformation (MPR)
 - ii. Maximum intensity projection (MIP)
 - iii. Minimum intensity projection (minIP)
 - iv. 2D and 3D rendering
 - v. Linear and nonlinear
 - vi. Visualization tools- vessel tracking, 4D angiography, cine, virtual reality
- 5. Informatics
 - i. Digital Imaging and Communications in Medicine (DICOM)
 - ii. Archive Picture Archiving and Communications System (PACS)
 - iii. Hospital information system /Radiology information system (HIS/RIS) networking
 - iv. Disks
- 6. Artifacts and reduction
 - i. Beam hardening
 - ii. Centering
 - iii. Motion
 - iv. Streaking
 - v. Metallic
 - vi. Partial volume averaging
 - vii. Algorithms
 - viii. Equipment artifacts
- 7. Rad Physics
 - i. Matter
 - ii. Absorption
 - iii. Attenuation
 - iv. Image Acquisition
- F. Cross Sectional Anatomy
 - 1. Cranium
 - a. Planes
 - b. Positioning
 - c. Pathology
 - 2. Neck
 - a. Planes
 - b. Positioning

- c. Pathology
- 3. Chest
 - a. Planes
 - b. Positioning
 - c. Pathology
- 4. Abdomen
 - a. Planes
 - b. Positioning
 - c. Pathology
- 5. Pelvis
 - a. Planes
 - b. Positioning
 - c. Pathology
- 6. Musculoskeletal system (MSK)
 - a. Planes
 - b. Positioning
 - c. Pathology

G. Imaging Procedures

- 1. Head and cranium
 - i. Internal auditory canal (IACS)
 - ii. Pituitary
 - iii. Orbits
 - iv. Sinuses
 - v. Temporomandibular joints (TMJ)
 - vi. Brain
 - vii. Vascular
 - viii. Temporal bones
- 2. Neck
- 3. Chest
 - i. Mediastinum
 - ii. Lungs
 - iii. Heart
 - iv. Vascular
- 4. Abdomen
 - i. Liver
 - ii. Adrenals
 - iii. Urinary tract and kidneys
 - iv. Spleen
 - v. Gastrointestinal (GI) tract
 - vi. Vascular
- 5. Pelvis
 - i. Bladder and ureters

- ii. Reproductive organs
- iii. Distal colon and rectum
- iv. Vascular
- 6. MSK
 - i. Upper extremity
 - ii. Lower extremity
 - iii. Spine
 - iv. Pelvis/hips
 - v. Shoulders
 - vi. Ribs
 - vii. Vascular
- 7. Special procedures
 - i. Myelography
 - ii. Arthrography
 - iii. Diskograms
 - iv. CT angiography (CTA)
 - v. Biopsies
 - vi. Runoffs
 - vii. Colonography
 - viii. 3D studies
 - ix. Aspirations/drainage
 - x. Perfusion studies

III. METHOD(S) OF INSTRUCTION

This course is taught using a variety of instructional methods, which include but are not limited to interactive lectures, computer presentations, group activities and exercises, videos, supplemental handouts and student presentations. Students are expected to be *ACTIVE* participants in the learning process. Students are expected to read the assigned readings prior to scheduled class meetings and come to class prepared to actively participate in all activities.

IV. REQUIRED TEXTBOOK(S)

- a. DeMaio, D. (n.d.). *Exam Review for Computed Tomography* (Current ed.). Mosby.
- b. Seeram, E. (n.d.). *Computed Tomography: Physical Principles, Clinical Applications, and Quality Control* (Current ed.). Elsevier.

V. REQUIRED MATERIALS

- A. A computer with internet access and basic software to include Word and PowerPoint (available through Jefferson College labs)

B. Course homepage available through Blackboard

VI. SUPPLEMENTAL REFERENCES

A. Supplemental Textbooks

- a. Peterson, Connie (n.d.) *Sectional Anatomy for Imaging Professionals* (Current Edition).Elsevier.

B. Class Handouts

C. Library Resources

- i. Textbooks
- ii. Periodicals
- iii. Films On Demand Videos

D. Internet Resources

- iv. On-line references
- v. Textbook companion website

VII. METHOD OF EVALUATION (basis for determining course grade)

GRADES—Grades will be based on the percentage of total points earned out of total points possible for this semester. The assignments will vary in the number of possible points based upon amount of work involved and complexity of material. The student should be aware that proofreading and revision are extremely important when preparing homework. All writing assignments submitted for grading should be final drafts.

EXAMS All exams with scores less than 75% must be retaken until a score of 75% or above is achieved to complete course requirements. The original score will be used to figure the semester grade. The student will be allowed to retake an exam a maximum of two times. If the student has not passed an exam within the three designated attempts, the student will present to the review board and may be dismissed from the program. The student must contact the instructor prior to any absence to make arrangements for retesting. Until course requirements are met the final grade will be an incomplete.

If an exam is not taken at the scheduled time and arrangements for a make-up exam have not been made prior to the designated exam time, the grade for that exam will be zero. **No make-up exam will be considered unless the instructor is personally notified prior to the absence.** If a student arranges to take the exam at other than the scheduled time, 5% will be deducted from the grade on that exam. Make-up exams are scheduled at the convenience of the instructor.

ASSIGNMENTS—In order to be prepared for each class meeting, the student should complete each homework assignment prior to the following class meeting. Assignments will consist of worksheets, textbook reading, review questions and other activities to enhance the learning experience.

Evaluation tools will include research projects, written and oral communication projects, class attendance/participation, homework assignments, and exams.

All assignments must be typewritten and are due at the beginning of class on the assigned due dates. Late assignments will not be accepted. In-class quizzes and assignments cannot be made up.

Grading Scale: (*Jefferson College Radiologic Technology Program's*)

A= 100-92%
B= 91.9-86%
C= 85.9-80%
D= 79.9-70%
F= 69.9 and below I=
Incomplete
W= Excused withdrawal from course

VIII. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Library; phone 636-481-3169).

IX. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College website, <http://www.jeffco.edu>).

X. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details. Student's grade will also be based on participation in class and attendance.

XI. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.