RAD175
Image Intensification & Equipment
3 Credit Hours

Revised by: Janet E. Akers BS RT (R)(M)
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RAD175 Image Intensification & Equipment

I. CATALOGUE DESCRIPTION

A. Prerequisites: Acceptance to Radiologic Technology Program, Reading Proficiency

B. Credit hour award: 3

C. Description: This course provides the student with the knowledge of x-ray equipment routinely utilized to produce diagnostic images. An overview of various recording media and image intensification units used in radiology will be discussed. (F)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

<table>
<thead>
<tr>
<th>Expected Learning Outcomes</th>
<th>Assessment Measures</th>
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<tbody>
<tr>
<td>Evaluate the components and function of an image intensification unit.</td>
<td>Written Assignments, Class Discussion/Activity, Written Examinations</td>
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<tr>
<td>Compare the use of video recorders, film cameras and automatic film changers.</td>
<td>Class Discussion/Activity, Written Examinations, Written Assignments</td>
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<tr>
<td>Discuss radiation protection standards that take place during the installation of radiographic equipment.</td>
<td>Class Discussion/Activity, Written Examinations, Written Assignments</td>
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III. OUTLINE OF TOPICS

A. Image Intensified Fluoroscopy
   1. Definition – Image Intensified Fluoroscopy vs. Conventional (obsolete) Non-Intensified Fluoroscopy
   2. History
      i. Thomas Edison
      ii. Edward Chamberlain
         1. Review of anatomy and physiology of human eye
   3. Components of Image Intensification Tube
      i. Input Phosphor
      ii. Photocathode
      iii. Output Phosphor
      iv. Electrostatic Focusing Lens
4. Brightness Gain
   i. Flux Gain
   ii. Minification Gain
   iii. Conversion Factor
5. Multifield Image Intensification
   i. Dual Field, Trifield tubes
   ii. Magnification Factor
   iii. Patient Dose
   iv. Contrast Resolution
   v. Spatial Resolution

B. Image Intensified Fluoroscopy, (cont.)
1. Television Camera Tube
   i. Vidicon or Plumbicon
   ii. Electron Gun
   iii. Electrosatic Grids
   iv. Target Assembly
      1. Face Plate or Window
      2. Signal Plate
      3. Target Plate
   v. Coupling
      1. Fiber Optic
      2. Lens Coupling
2. Television Picture
   i. Cathode Ray Tube Design
   ii. Modulation
   iii. Raster Pattern
   iv. Field Interlace – Frame
   v. Vertical Resolution
   vi. Horizontal Resolution – Bandwidth, Bandpass
3. Image Qualities
   i. Brightness
      1. Automatic Brightness Control
      2. Automatic Gain Control
      3. Contrast
      4. Noise
      5. Lag
      6. Resolution
      7. Vignetting
      8. Magnification – Electronics vs. Large OID

C. Image Intensified Fluoroscopy, (cont.)
1. Recording the Image
   i. Radiographic Cassette
   ii. Photospot Camera
   iii. Cine
   iv. Video recording
   v. DF
2. Radiation Safety
   i. Fluoro Exposure Time
   ii. Dose Rate – Tube mA
   iii. Exposure Switch
   iv. Collimation
   v. Filtration
   vi. Minimum Source-to-skin Distance
   vii. Shielding – Primary Barrier, Curtain, Gloves, Aprons

D. Radiographic Equipment Installation
   1. Radiographic Tube Construction
      i. Cathode Assembly
      ii. Anode
      iii. Envelope
      iv. Housing
   2. Factors Governing Tube Life
      i. Filament Factors
      ii. Anode Factors
      iii. Tube Charts
         1. Tube Rating Charts
         2. Cooling Curves
         3. Heat Units
   3. Operators Console
      i. Autotransformer
      ii. kVp and mAs Adjustments
      iii. Exposure Timers
      iv. Automatic Exposure Control
   4. Three Phase Generators
   5. High Frequency Generators
   6. Mobile X-ray Equipment
      i. Battery Powered
      ii. Capacitor Discharged Units
         1. Wave-Tail Cutoff
         2. Grid Controlled Triodes
      iii. AC Powered

E. Digital Imaging and PACS
   1. Analog vs. Digital Imaging
      i. Analog vs. Digital
      ii. Digital Fluoroscopy
      iii. Scanned Projection Radiography
      iv. Computed Radiography
   2. Image Characteristics
      i. Image Matrix
      ii. Pixel
      iii. Field of View
      iv. Gray Scale Range
      v. Window Width and Window Level
3. Digital Radiography
   i. SPR (scanned projection radiograph)
   ii. CR (computed radiography)
   iii. DR (digital radiography)
   iv. DF (digital fluoroscopy)
   v. Film Digitizers

4. PACS (picture archiving and communication systems)
   i. Display
   ii. Network
   iii. Storage

IV. 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.

V. REQUIRED TEXTBOOK(S)


VI. REQUIRED MATERIALS

A. A computer with internet access and basic software to include Word and Power Point (available through Jefferson College labs)
B. Course homepage available through Blackboard
C. Binder, paper, pens, pencils with erasers, highlighters

VII. SUPPLEMENTAL REFERENCES

A. Class Handouts
B. Library Resources
   1. Textbooks
   2. Periodicals
   3. Films On Demand Videos
C. Internet Resources
   1. On-line references
   2. Textbook companion website
VIII. 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. A final semester grade of 80% or above must be achieved in this course to successfully complete this course.

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.

Student’s grade will also be based on participation in class and attendance.

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

IX. ADA AA STATEMENT

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

X. 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).

XI. ATTENDANCE STATEMENT

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.

XII. OUTSIDE OF CLASS ACADEMICALLY-RELATED ACTIVITIES

The US 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.