



A POLYTECHNIC INSTITUTION

School of Health Sciences
Program: Medical Radiography
Option:

MRAD 1102
Image Recording and Equipment

Start Date: January, 2006**End Date:** April, 2006**Total Hours:** 45 **Total Weeks:** 15**Term/Level:** 1 **Course Credits:** 3.0**Hours/Week:** 3 **Lecture:** 2 **Lab:** 1**Shop:** **Seminar:** **Other:****Prerequisites****MRAD 1102 is a Prerequisite for:****Course No. Course Name****Course No. Course Name**

None

MRAD 1108

MRAD 2212

Course Description

This course will explore the fundamentals of radiographic image recording and processing, as well as introduce the basic concepts of processor quality control. Specifically, the following topics will be covered: computer radiography (CR), digital radiography (DR) and film/screen (F/S) image recording, image recording artifacts, basic radiographic system components, introduction to the properties of X-radiation and the principles of ALARA, factors influencing the radiographic image, grids, automatic timers (AEC), anatomical programmed radiography (APR), automatic film processing, sensitometry and a brief introduction to fluoroscopy and tomography.

Detailed Course Description

This course is designed to provide students with the knowledge needed to operate radiographic imaging equipment and use radiographic equipment and accessories to record and process radiographic images and to help students understand technical and physical principles affecting the radiographic image.

Evaluation

Final Examination	40%
Midterm #1	20%
Midterm #2	25%
Assignments	5%
Lab Reports	10%
TOTAL	100%

Comments: A grade of 65% is required to pass the course.

Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. describe the major components of a computed radiography (CR) system.
2. identify the elements of a CR image acquisition system.

Course Learning Outcomes/Competencies (cont'd.)

3. identify the major components of a radiographic room.
4. explain how factors in each of the following categories influence the radiographic image:
 - a. patient
 - b. radiographic exposure factors
 - c. beam geometry
 - d. grids
 - e. generator
 - f. distance
 - g. AEC
 - h. APR
5. discuss the properties of X- radiation, the principles of ALARA and radiation monitors.
6. discuss image acquisition, image quality and image processing algorithms:
7. describe accessory radiographic equipment such as:
 - a. grids.
 - b. filters
 - c. collimation
8. briefly identify the elements of radiographic film processing
9. explain the conditions of operation for:
 - a. darkroom film processing
 - b. cassette/film handling
10. recognize chemical hazards and use appropriate handling techniques.
11. draw a sensitometry curve and extrapolate speed and contrast from curve.
12. utilize sensitometry to identify and correct film processing problems.
13. briefly describe the major components of fluoroscopic and tomographic systems.

Verification

I verify that the content of this course outline is current.

Kita W Saugh
Authoring Instructor

6 Dec 2005
Date

I verify that this course outline has been reviewed.

M. Filippelli
Program Head/Chief Instructor

Dec 6/05
Date

I verify that this course outline complies with BCIT policy.

Alan Bell
Dean/Associate Dean

Dec 7/05
Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

CAMRT COMPETENCIES

On successful completion of the above outcomes, you should be prepared to perform the following competencies as defined in the "Competency Profile" for radiographers established by the CAMRT.

IMAGE RECORDING AND EQUIPMENT

CRITICAL TASKS

A2 Prepare room for radiographic imaging procedures

- A2.5 Obtain accessory imaging apparatus
- A2.6 Select/prepare imaging system

A3 Perform pre-procedural tasks

- A3.3 Ensure proper patient attire for the procedure
- A3.4 Confirm patient preparation
- A3.5 Remove all items that would compromise the quality of the image

A4 Position the patient

- A4.10 Collimate to the area of interest only to maximize image quality

A5 Operate imaging equipment

- A5.1 Select and use apparatus and accessory equipment safely
- A5.3 Select and use examination protocol for digital imaging
- A5.4 Select/adjust distance parameters
- A5.6 Select the image receptor system.
- A5.7 Select/modify exposure factors on the basis of technical considerations.
- A5.9 Take/monitor the exposure.
- A5.10 Select automatic exposure control parameters where applicable

A6 Perform image processing tasks

- A6.1 Imprint ID information
- A6.2 Manipulate computer data, if applicable
- A6.3 Process images
- A6.4 Reload the cassette/magazine

A7 Critique images and implement corrective measures

- A7.1 Verify patient/film ID
- A7.5 Recognize image artifacts and take appropriate action
- A7.8 Manipulate the digital image

B1 Protect the patient

- B1.6 Collimate only to the area of interest to minimize patient dose.

- B1.7 Select exposure factors, keeping radiation dose as low as reasonably achievable
- B1.9 Monitor fluoroscopic exposure and note fluoroscopic time.

B2 Protect the technologist

- B2.1 Stand behind protective barriers
- B2.2 Wear lead protective apparel
- B2.3 Remain as far as possible from patient and source during exposure.
- B2.4 Use positioning aids/immobilization devices
- B2.6 Collimate to the area of interest to minimize scatter.

B3 Protect others required to be present during the procedure

- B3.2 Instruct individuals in the radiation area to maintain a safe distance and/or use radiation barriers during the exposure.
- B3.3 Provide protective apparel for individuals remaining with patient during exposure.
- B3.4 Collimate to the area of interest to minimize scatter

B4 Protect individuals not required to be present during the procedure

- B4.1 Close the doors of the radiation area when in use
- B4.2 Instruct individuals to leave the vicinity during imaging procedure.
- B4.3 Educate individuals regarding radiation protective practices

B5 Monitor personal radiation exposure

- B5.1 Wear/maintain radiation monitoring device

C2 Establish patient trust and confidence

- C2.4 Respond to patient's concerns

D1 Monitor and maintain processing equipment and facilities

- D1.2 Prepare processing chemicals
- D1.3 Perform start-up/shut-down procedures
- D1.4 Inspect rollers and gears
- D1.7 Check/adjust solution levels
- D1.13 Perform sensitometry
- D1.14 Interpret sensitometry results and initiate corrective action

D3 Perform quality control tasks

- D3.1 Perform quality control tests on imaging and accessory equipment
- D3.2 Interpret test results to initiate corrective action
- D3.7 Inspect and clean cassettes/imaging receptors
- D3.8 Inspect and clean illuminators/monitors.

Instructor(s)

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Learning Resources

Required:

Bushong, S. 2004. *Radiologic Science for Technologists: Physics, Biology, and Protection*, 8th Edition, Elsevier, Mosby: Canada

Recommended:

- Carlton, R. & A. (1996). *Principles of Radiographic Imaging, an Art and a Science*, 3rd Edition, Delmar.
- Cullinan, A. & J. (1994). *Producing Quality Radiographs*, 2nd Edition, J.B. Lippincott Co.
- Currey, T. et al. (1990). *Chistensen's Introduction to the Physics of Diagnostic Radiology*, 4th Edition.
- Gray, J., et al. (1983). *Quality Control in Diagnostic Imaging*, Aspen Publishers Inc.
- Tortorici, M. (1992). *Medical Radiographic Imaging: Circuitry, Exposure and Quality Control*. W.B. Saunders.
- Fuch's *Radiographic Exposure, Processing and Quality Control*. (1998). 6th ed. Q.B. Carroll.
- Fauber, T.L. (2000). *Radiographic Imaging & Exposure*. Mosby.
- Shephard, C.T., (2003). *Radiographic Image Production and Manipulation*. McGraw-Hill.
- Dreyer, K.J. et al (2002). *PACS Picture Archiving and Communications Systems: A guide to the digital revolution*, Springer.

Information for Students

(Information below can be adapted and supplemented as necessary.)

The following statements are in accordance with the BCIT Student Regulations policy 5002. To review the full policy, please refer to: <http://www.bcit.ca/~presoff/5002.pdf>

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

Academic Misconduct: Violations of academic integrity, including dishonesty in assignments, examinations or other academic performances are prohibited and will be handled in accordance with the "Violations of Standards of Conduct" section of Policy 5002.

Attendance/Illness: In the case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with his/her instructor or Program Head of Chief Instructor, indicating the reason for the absence. Prolonged illness of three or more consecutive days must have a BCIT medical certificate sent to the department. Excessive absence may result in failure or immediate withdrawal from the course or program.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.

Lab Report Details

There is a lab report required for each lab. The completed lab report is to be submitted prior to the following lab. The lab assignments will count for 10% of the final grade.

Assignment Details

There are readings and Web CT assignments. It is expected that all students submit these assignments in a timely fashion as we reach the appropriate section. Failure to submit any assignment by the specified time will result in the loss of 1 mark for each day late. Submission of these assignments will count for 5% of the final grade.

Schedule for 2006

Week	Week of	Lecture	Lab # and Topic
1	Jan. 4	M. Stat holiday F. Course Outline and Introduction to Fuji CR	No Lab
2	Jan. 9	M. Using Fuji CR System – Guest lecturer F. Digital Image Recording	1. Computed Radiography Orientation
3	Jan. 16	M. Digital Image Recording F. X-ray Components	2. Using CR
4	Jan. 23	M. X-ray Tube F. Properties of X-rays	3. X-ray Room Operation
5	Jan 30	M. Principles of ALARA F. Digital Radiography (DR)	4. ALARA Principles
6	Feb. 6	M. Midterm 1 F. Post-Processing	5. CR Exposure latitude
7	Feb. 13	M. Factors Influencing the Image F. Exposure Factors	6. Inverse Square Law
8	Feb. 20	M. Beam Geometry F. Grids	7. Collimator Accuracy Test
9	Feb. 27	M. Grid Errors F. Automatic Timers (AEC)	8 Grids and Grid Errors
10	Mar. 6	M. Grids and Grid Errors F. Midterm 2	9. Compensating Filters
	Mar. 13	Spring Break	
11	Mar. 20	M. Automatic Timers F. Anatomical Programmed Radiography	10. Comparison of CR Cassette Sizes
12	Mar. 27	M. Film Processing F. Darkroom	11. Film Processing Orientation
13	Apr. 3	M. Sensitometry F. BCIT Open House	12. Sensitometry
14	Apr. 10	M. Fluoroscopy and Tomography F. Stat Holiday	13. Photography and Radiography
15	Apr. 17	Exam Week	