



A POLYTECHNIC INSTITUTION

School of Health Sciences

Program: Medical Radiography

Option:

**MRAD 1102****Image Recording and Equipment****Start Date:** January, 2004**End Date:** April, 2004**Total Hours:** 45 **Total Weeks:** 15**Term/Level:** 1 **Course Credits:** 3.0**Hours/Week:** 3 **Lecture:** 2 **Lab:** 1**Shop:** **Seminar:** **Other:****Prerequisites****Course No. Course Name**

None

**MRAD 1102 is a Prerequisite for:****Course No. Course Name**

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: automatic processing, basic radiographic system components, recording material including digital, density, the photographic process, image recording artifacts, radiographic contrast, accessory equipment, sensitometry, duplication and subtraction techniques, automatic timers, anatomical programmed radiography (APR) 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 processing 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	35%	Comments: A grade of 60% is required to pass the course.
Midterm #1	20%	
Midterm #2	25%	
Assignments	10%	
Lab Reports	10%	
<b>TOTAL</b>	<b>100%</b>	

**■ Course Learning Outcomes/Competencies**

Upon successful completion, the student will be able to:

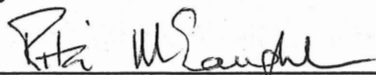
1. identify the elements of radiographic processing and describe the major components of automatic film processors.
2. identify the major components of radiographic equipment.

■ **Course Learning Outcomes/Competencies (cont'd.)**

3. describe the essential features of image recording materials such as x-ray film, intensifying screens, cassettes CR, DR and PACS.
4. explain how factors in each of the following categories influence the radiographic image:
  - a. radiographic exposure;
  - b. geometric;
  - c. processing;
  - d. patient.
5. explain the basic principles of the photographic process.
6. identify and explain accessory equipment for:
  - a. patients, e.g., immobilization devices,
  - b. radiographic procedures, e.g., grids, filters, cones, etc.
7. explain the conditions of operation for:
  - a. darkroom processing, e.g., film storage, lighting.
  - b. daylight processing.
8. describe common faults, causes and corrective measures of processing artifacts.
9. recognize chemical hazards and apply corrective measures when appropriate.
10. explain the principles of sensitometry.
11. describe briefly image viewing equipment.
12. briefly describe the major components of fluoroscopic and tomographic systems.


■ **Verification**

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

  
Authoring Instructor

Dec 11/03  
Date

I verify that this course outline has been reviewed.

  
Program Lead/Chief Instructor

Dec 11/03  
Date

I verify that this course outline complies with BCIT policy.

  
Dean/Associate Dean

Dec 11 2003  
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 the correct image receptor system

##### ***A4 Position the patient***

- A4.7 Use immobilization and positioning aids as required
- 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
- A5.2 Perform the initial set-up of the equipment
- A5.4 Select the source-image distance
- A5.5 Use radiographic markers
- A5.6 Select the fastest film/screen/grid combination for optimum image quality appropriate for the examination.
- A5.7 Select appropriate kV, mA and time or automatic exposure control parameters.
- A5.8 Modify exposure factors on the basis of the patient's age, physique and condition.
- A5.9 Take the exposure

##### ***A6 Process Image***

- A6.1 Imprint ID information
- A6.3 Unload the film/magazine and process exposed film
- A6.4 Reload the cassette/magazine

##### ***A7 Critique images and implement corrective measures***

- A7.1 Verify patient/film ID
- A7.2 Check for correct use and placement of markers
- A7.5 Recognize film artifacts and take appropriate action

##### ***B1 Protect the patient***

- B1.6 Collimate only to the area of interest to minimize patient dose.
- B1.7 Select exposure factors consistent with optimal image quality and minimum radiation dose
- B1.8 Use additional filters as required
- 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 when remaining in the radiation area
- B2.3 Remain as far as possible from patient and source during exposure.
- B2.4 Use positioning aids/immobilization devices to avoid having to hold the patient during the procedure.

### ***B3 Protect others required to be present during the procedure***

- B3.2 Instruct people in the radiation area to maintain a safe distance and/or use radiation barriers during the exposure.
- B3.3 Provide protection for people remaining with the patient during exposure.

### ***B4 Protect others not required to be present during the procedure***

- B4.1 Close the doors of the radiation area when in use
- B4.2 Instruct people to leave the vicinity during imaging procedure.

### ***B5 Monitor personal radiation exposure***

- B5.1 Wear radiation monitoring device

### ***C2 Establish patient trust and confidence***

- C2.3 Explain the procedure at an appropriate level of understanding for the patient
- C2.4 Answer the patient's questions as fully as possible
- C2.7 Provide information on radiation

### ***D1 Monitor and maintain processing equipment and facilities***

- D1.2 Prepare new chemicals
- D1.3 Perform start-up/shut-down procedures
- D1.7 Check solution levels
- D1.13 Perform sensitometry
- D1.14 Use sensitometry results to initiate corrective action

### ***D3 Perform quality control tasks***

- D3.7 Inspect and clean cassette regularly
- D3.8 Inspect and clean illuminators.

## ■ Instructor(s)

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## ■ Learning Resources

### *Required:*

Bushong, S. 1997. *Radiologic Science for Technologists*, 7th Edition, Harcourt: Canada

### *Recommended:*

- Carlton, R. & A. (1996). *Principles of Radiographic Imaging, an Art and a Science*, 2nd 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

## ■ Information for Students

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

**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.

**Makeup Tests, Exams or Quizzes:** There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

**Ethics:** BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.

**Attendance:** The attendance policy as outlined in the current BCIT Calendar will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

**Illness:** A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects, or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

**Attempts:** Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the appropriate 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. These assignments are due on or before the last scheduled class for this course. Completion of these assignments will count for 10% of the final grade.

## Schedule

Week	Week of	Lecture	Lab
1	Jan. 5	1. Course Introduction 2. Automatic Film Processing	Automatic Processor Orientation
2	Jan. 12	1. Image Receptor Systems 2. Fuji CR System	Automatic Processor
3	Jan. 19	1. Image Receptor Systems (CR) 2. The Photographic Process	Computed Radiography
4	Jan. 26	1. Sensitometry 2. Sensitometry	Photography and Radiography
5	Feb. 2	1. Speed/Technique Calculations 2. Review	Sensitometry
6	Feb. 9	1. Midterm 2. Production of the Radiograph	Film/Screen Comparison
7	Feb. 16	1. Production of the Radiograph 2. Filtration	Sensitivity Numbers
8	Feb. 23	1. Collimation 2. Collimation	Compensating Filters
9	Mar. 1	1. Grids and Errors 2. Review	Collimator Accuracy Test
10	Mar. 8	1. Midterm 2. Fluoroscopy and Tomography	Grids and Grid Errors
	Mar. 15	<b>Spring Break</b>	
11	Mar. 22	1. Density 2. Inverse Square Law	Screen Cleaning and Viewbox Maintenance
12	Mar. 29	1. Other Factors Affecting Density 2. Contrast	Density
13	Apr. 5	1. Focal Spot Size & Line Focus Principle 2. Review	Contrast Scales
14	Apr. 12	<b>Exam Week</b>	