



A POLYTECHNIC INSTITUTION

School of Health Sciences
Program: Medical Radiography
Option:

MRAD 1102
Image Recording and Equipment

Start Date: January, 2005	End Date: April, 2005
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	

v 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 computed and digital radiography), density, the photographic process, image recording artifacts, radiographic contrast, accessory equipment, sensitometry, automatic timers, anatomical programmed radiography (APR) and a brief introduction to fluoroscopy and tomography.

v 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.

v 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%	
TOTAL	<u>100%</u>	

v Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

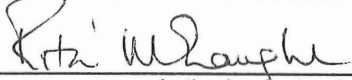
1. identify the elements of radiographic processing and describe the major components of automatic film processors.
2. identify the major components of radiographic equipment.

v Course Learning Outcomes/Competencies (cont'd.)

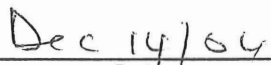
3. describe the essential features of image recording materials such as x-ray film, intensifying screens, cassettes CR, DR and PACS.
4. explain how factors in each of the following categories influence the radiographic image:
 - a. radiographic exposure;
 - b. geometric;
 - c. processing;
 - d. patient.
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.

v Verification

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



Authoring Instructor



Date

I verify that this course outline has been reviewed.



Program Head/Chief Instructor

Date

I verify that this course outline complies with BCIT policy.



Dean/Associate Dean



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

- A4.7 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
- A5.3 Select and use examination protocol for digital imaging
- A5.4 Select/adjust distance parameters
- A5.5 Use appropriate radiographic markers
- 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
- A7.2 Check for correct use and proper placement of markers
- 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.

v Instructor(s)

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(and at other times by
appointment)

v 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

v 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.

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.

v 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.

v Assignment Details

There are readings and Web CT assignments. While it is expected that all students submit these assignments in a timely fashion as we reach the appropriate section, these assignments are due on or before the last scheduled class for this course. Failure to submit any assignment by this date will result in loss of 1 mark per day late. Completion of these assignments will count for 10% of the final grade.

Schedule for 2005

Week	Week of	Lecture	Lab # and Topic
1	Jan. 3	M. Stat holiday F. Course Outline and Introduction	1. Automatic Processor Orientation
2	Jan. 10	M. Automatic Film Processing F. Fuji CR System – Guest lecturer	2. Automatic Processor
3	Jan. 17	M. Image Receptor Systems (CR) F. Image Receptor Systems (F/S)	3. Computed Radiography (CR)
4	Jan. 24	M. The Photographic Process F. The Photographic Process	4. Photography and Radiography (F/S - darkroom)
5	Jan 31	M. Midterm F. Sensitometry	5. Sensitivity Numbers (CR)
6	Feb. 7	M. Sensitometry F. Sensitometry	6. Film/Screen Comparison (F/S - darkroom)
7	Feb. 14	M. Production of the Radiograph F. Production of the Radiograph	7. Sensitometry (Darkroom)
8	Feb. 21	M. Filtration F. Collimation	8. Screen and Viewbox Cleaning Set D to complete later
9	Feb. 28	M. Collimation F. Grids and Grid Errors	9. Compensating Filters (CR)
10	Mar. 7	M. Grids and Grid Errors F. Midterm	10. Collimator Accuracy Test (CR)
	Mar. 14	Spring Break	
11	Mar. 21	M. Fluoroscopy and Tomography F. Good Friday – Stat holiday	11. Grids and Grid Errors Sets C and D
12	Mar. 28	M. Easter Monday – Stat holiday F. Density	11. Grids and Grid Errors Sets A and B Set D to complete Lab 8
13	Apr. 4	M. Density F. Contrast	12. Density
14	Apr. 11	M. Contrast F. Review	13. Contrast Scales
15	Apr. 18	Exam Week	