BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

School of Health Sciences
Program: Medical Radiography
Option:

Course Outline

MRAD 1102
Image Recording and Equipment

Start Date: January, 2002 **End Date:** April, 2002

Course Credits: 3.0 **Term/Level:** 1

Total Hours: 45
Total Weeks: 15

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 Calendar 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, density, the photographic process, image recording artifacts, radiographic contrast, accessory equipment, sensitometry, duplication and subtraction techniques, automatic timers, anatomical programmed radiography (APR) and an brief introduction to fluoroscopy and tomography.

Course Goals

To provide students with the knowledge needed to operate radiographic processing equipment and use radiographic equipment and accessories to record and process radiographic images. To help students understand technical and physical principles affecting the radiographic image.

Evaluation

A grade of 60% is required to pass the course.

Final Examination	40%
Quiz #1	25%
Quiz #2	25%
Lab Reports	10%
TOTAL	100%

Course Learning Outcomes/Competencies

Upon successful completion of this course, 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.
3. describe the essential features of image recording materials such as x-ray film, intensifying screens, cassettes.
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 each of the following: duplication and subtraction of radiographic images and image viewing equipment (construction and conditions).
12. briefly describe the major components of fluoroscopic and tomographic systems.

Course Content Verification

I verify that the content of this course outline is current, accurate, and complies with BCIT Policy.

M. Filippelli — Program Head/Chief Instructor

Dec 2001 — 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.

BCIT Policy Information for Students

Assignment Details

There is a lab assignment for each lab. The completed lab report is to be submitted prior to the following lab.

Week	Week of	Lecture	Lab
1	Jan. 4	1. Course Introduction/Automatic Processors	Orientation to Automatic Processor
2	Jan. 9 Jan. 11	1. Basic Radiographic Components 2. Overview of Recording Materials	Automatic Processor
3	Jan. 16 Jan. 18	1. Intensifying Screens 2. Intensifying Screens	Screen Comparison
4	Jan. 23 Jan. 25	1. Collimators 2. Density – mAs, Distance	Collimator Tests
5	Jan. 30 Feb. 1	1. Density – mAs, Distance 2. Density – kV	Density – mAs, & Distance,
6	Feb. 6 Feb. 8	1. Photographic Effect 2. Filtration – Tube & Compensating	Density kV
7	Feb. 13 Feb. 15	1. Film Artifacts 2. Radiographic Contrast	**Quiz #1**
8	Feb. 20 Feb. 22	1. Grids 2. Grid Errors	Contrast – kV
9	Feb. 27 Mar. 1	1. PD Day 2. Automatic Processing	Grids
10	Mar. 6 Mar. 8	1. Processing Area 2. Illumination/Duplication	**Quiz 2**
	Mar. 11–15	**Spring Break**	
11	Mar. 20 Mar. 22	1. Radiographic Quality 2. Sensitometry	Grid Errors
12	Mar. 27 Mar. 29	1. Sensitometry 2. Easter Holiday	Sensitometry
13	Apr. 3 Apr. 5	1. Autotimers and APR 2. Introduction to Fluoroscopy	Photography
14	Apr. 10 Apr. 12	1. Screen and View Box Cleaning 2. Introduction to Tomography	Screen and Viewbox Cleaning
15	Apr. 15–19	**Exam Week**	