



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

School of Health Sciences

Program: Medical Radiography

Option:

Course Outline

MRAD 2212

**Image Recording, Equipment
and Quality Control 2**

Start Date: September, 2000

End Date:

Course Credits:

Term/Level: 2

Total Hours: 18

Total Weeks: 9

Hours/Week: 2

Lecture: 2

Lab:

Shop:

Seminar:

Other:

Prerequisites

Course No. Course Name

MRAD 1101 Image Recording, Equipment
and Quality Control 1

MRAD 2212 is a Prerequisite for:

Course No. Course Name

MRAD 3313 Image Recording, Equipment
and Quality Control 3

Course Calendar Description

Through lectures and readings, this course will deal with x-ray tubes; circuits and generators, fluoroscopic equipment and quality control (QC). In particular, the elements of QC will be discussed together with the procedural aspects of the following QC tests: level accuracy, section thickness exposure; exposure timer accuracy; collimation test; focal spot assessment; screen-film contact test, mA linearity; repeatability and mR/mAs output; inspection procedures for radiographic equipment.

Course Goals

To provide students with a knowledge of the fundamental principles of x-ray tubes, generators and circuits needed for effective utilization and operation of radiographic equipment and to describe the characteristic features of fluoroscopic equipment. In addition, the course will introduce the concepts of Quality Assurance (QA) and Quality Control (QC) which will allow students to carry out *selected* QC tests on routine radiographic equipment.

Evaluation

Final Examination	50%	Both examinations will be of the multiple choice format.
Mid-Term Examination	30%	
Laboratory QC Report	10%	The format of the Lab Report will be discussed in class.
1 Quiz	10%	
TOTAL	100%	

Course Learning Outcomes/Competencies

Upon successful completion of this course, the student will be able to:

1. Outline the essential characteristics of radiographic, fluoroscopic, and digital imaging schemes.
2. Describe the major components of the x-ray generator and its associated circuitry.
3. Differentiate between different types of x-ray tubes.
4. Explain how x-ray exposure timers work.
5. Describe the characteristic features of fluoroscopic equipment.
6. Differentiate between the terms quality assurance (QA) and quality control (QC) and list the advantages of a QA program.
7. Describe the elements of QC in terms of:
 - a. equipment for QC
 - b. parameters for QC monitoring
 - c. QC test procedures
 - d. image quality standards
 - e. tolerance limits
 - f. error correction
8. Explain the following QC tests and carry out **selected** tests in conjunction with positioning labs:
 - a. level accuracy, section thickness, exposure and tube movement in conventional tomography
 - b. exposure timer accuracy
 - c. collimator test
 - d. focal spot assessment
 - e. screen-film contact test
 - f. mA linearity
 - g. repeatability and mR/mAs output
 - h. inspection procedures for radiographic equipment

On successful completion of these outcomes, students will be prepared to meet the requirements of the following competencies as listed in the CAMRT "Competency Profile" for Radiography.

A2 Prepare the room for fluoroscopic imaging procedures.

A2.5 Obtain accessory imaging equipment.

A2.6 Select the correct image receptor system (conventional vs digital).

A4 Position the patient.

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

Course Learning Outcomes/Competencies (continued)

A5 Operate imaging equipment.

- A5.1 Select and use apparatus and accessory equipment safely.
- A5.2 Perform the initial set-up of the equipment.
- A5.3 Select the computer protocol for digital imaging.
- 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 images.

- A6.1 Imprint ID information.
- A6.2 Manipulate computer data, if applicable.
- A6.3 Unload the film cassette/magazine and process exposed film.
- A6.4 Reload the cassette/magazine.

A7 Critique images and implement corrective measures.

- A7.8 Manipulate the digital image.

D2 Monitor radiographic/fluoroscopic equipment.

- D2.1 Perform visual inspection of cables and equipment.
- D2.2 Recognize improper functioning of imaging and accessory equipment/devices.
- D2.3 Ensure the proper operation of safety devices.
- D2.4 Record and report equipment malfunctions to the appropriate person.

D3 Perform quality control tasks.

- D3.1 Perform quality control tests on imaging and accessory equipment.
- D3.2 Use test results to initiate corrective action.
- D3.3 Record and maintain records/charts of all tests.
- D3.4 Test lead aprons and shields.
- D3.5 Report test results to appropriate person.
- D3.6 Conduct repeat/reject analysis.

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

Aug 31/00
Date

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



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Instructor(s)

Euclid Seeram, RTR, BSc, MSc

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Office Hrs.: As posted

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Learning Resources

Required:

- Bushong, S. Radiologic Science for Technologists. Mosby-Year Book, Inc. 1997.
- Nelson, M.T. Continuous Quality Improvement (CQI) in Radiology. Applied Radiology. July, 1994.

Additional References:

- Papp, J. Quality Management in the Imaging Sciences. C.V. Mosby. 1998.
 - Gray, J. et al. Quality Control in Diagnostic Imaging. Aspen Publishers Inc. 1983.
 - Thompson, M.A. et al. Principles of Imaging Science and Protection. W.B. Saunders Co. 1994.
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BCIT Policy Information for Students

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Assignment Details



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Schedule

MRAD 2212

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Week	Material Covered	Reference/Reading
Week 1 All Groups	Course Introduction - Learning Outcomes - References - Evaluation Basic Imaging Schemes - Radiography - Tomography - Fluoroscopy - Digital Imaging	Seeram, E. Course Outline Bushong, Ch. 1, Fig. 1-6 Bushong, Ch. 25, Fig. 25-2 Seeram, E.
Week 2 All Groups	X-Ray Generators and Associated Circuitry - What is a generator? - Purpose - Types of Generators - Associated Circuitry - Ratings	Bushong, Ch. 9
Week 3 All Groups	X-Ray Tubes - Stationary-Anode Tubes - Rotating-Anode Tubes - New Anode Disk Technology	Bushong, Ch. 10
Week 4 All Groups	X-Ray Tubes (continued) - Recent Developments in X-Ray Tubes - Specialized X-Ray Tubes - Insulation and Cooling - Tube Rating Charts	Bushong, Ch. 10
Week 5 All Groups First Hour	X-Ray Exposure Timers - Electronic Timers - Automatic Exposure Timers	Bushong, Ch. 9
Week 5 All Groups Second Hour	MID-TERM EXAMINATION	Seeram, E.
	The exam is based on all materials covered up to Week 4.	
Week 6 AC BD	Conventional Tomography - Linear Tomography Continuous Quality Improvement - Concepts - Equipment	Bushong, Ch. 22, p. 282–286 Bushong, Ch. 31

Week	Material Covered	Reference/Reading
Week 7 AC BD	Quality Control Tests • Tomography Tests – Level Accuracy – Cut Thickness • Collimator Test • Screen-Film Contact Test • Inspection Procedures for Radiography Equipment	Bushong, Ch. 31 Gray
Week 8 AC BD	Quality Control Tests • kVp Accuracy (Darlene?) • mA Linearity • mAs Repeatability • mR/mAs Output • Focal Spot Assessment • Exposure Timer Accuracy	Bushong, Ch. 31
Week 9 AC BD	Fluoroscopy • Image Intensification • Fluoroscopic Image Monitoring • Spot Filming	Bushong, Ch. 25
Week 10 All Groups	FINAL EXAMINATION	Seeram, E.
	The final examination is based on the entire course. Questions will be based on all topics covered this term, however, the exam will be weighted on topics after the mid-term. Best wishes.	