



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

Course Outline Part A

School of Health Sciences

Program: Medical Radiography

Option:

MRAD 2212

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

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Hours/Week:	2	Total Hours:	18	Term/Level:	2
Lecture:	2	Total Weeks:	9	Credits:	
Lab:					
Other:					

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#### Prerequisites

Course No. Course Name  
MRAD 1101 Image Recording, Equipment and  
Quality Control I

#### MRAD 2212 is a Prerequisite for:

Course No. Course Name  
MRAD 3313 Image Recording, Equipment and  
Quality Control III

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#### 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 mammographic equipment. In addition, the course will introduce the concepts of Quality Assurance (QA) and Quality Control (QC) which allow students to carry out selected QC tests on routine radiographic equipment.

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#### Course Description

Through lectures and readings, this course will deal with x-ray tubes; circuits and generators, mammographic 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 and tube movement in tomography exposure timer accuracy; collimation test; focal spot assessment; darkroom light and leakage test; safe handling time for films in the darkroom; screen-film contact test, mA linearity; repeatability and mR/mAs output; inspection procedures for radiographic equipment and illuminator brightness.

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#### 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 Outcomes and Sub-Outcomes

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

1. Differentiate between different types of x-ray tubes.
2. Describe the major components of the following three x-ray circuits which make up the x-ray machine:
  - a. operating control circuit
  - b. high voltage circuit
  - c. filament circuit
3. Identify 5 types of x-ray generators and explain how each of the following works:
  - a. falling load generator
  - b. constant potential generator
  - c. medium and high frequency generators
4. Describe the characteristic features of mammographic equipment.
5. Differentiate between the terms quality assurance (QA) and quality control (QC) and list the advantages of a QA program.
6. 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
7. Explain the following QC tests and carry out the first 7 listed below:
  - a. level accuracy, section thickness, exposure and tube movement in conventional tomography
  - b. exposure timer accuracy
  - c. collimator test
  - d. focal spot assessment
  - e. darkroom light and leakage test
  - f. safe handling time for films in the darkroom
  - g. screen-film contact test

- h. mA linearity
- i. repeatability and mR/mAs output
- j. inspection procedures for radiographic equipment
- k. illuminator brightness

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**Course Record**

Developed by: Euclid Seeram  
Instructor Name and Department (signature)

Date: Sept., 1995

Revised by: \_\_\_\_\_  
Instructor Name and Department (signature)

Date: \_\_\_\_\_

Approved by: Ann McMillen  
Associate Dean / Program Head (signature)

Start Date: Sept., 1995



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

School of Health Sciences

Program: Medical Radiography

Option:

Course Outline Part B

**MRAD 2212**

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

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### **Effective Date**

September 1995

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### **Instructor(s)**

Euclid Seeram, RTR., BSc., M.Sc.

Office No.: SW3 4084

Phone: 8231

Office Hrs.: As posted.

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### **Text(s) and Equipment**

Required:

- Bushong, S.: Radiologic Science for Technologists. Mosby-Year Book, Inc. 1993. Chapter 7; Chapter 17, pp. 301-303; Chapter 20; Chapter 25
- Quality Assurance Concepts — Chapter 19 — In Seeram, E. X-Ray Imaging Equipment. Charles C. Thomas. 1985. pp. 481-498.
- Nelson, MT.: Continuous Quality Improvement (CQI) in Radiology. Applied Radiology. July 1994.

Recommended:

- Gray, J. et al.: Quality Control in Diagnostic Imaging. Aspen publishers Inc. 1983.
- Moores, B.M. et al.: Practical Guide to Quality Assurance in Medical Imaging. John Wiley and Sons. 1987.
- Thompson, MA. et al. Principles of Imaging Science and Protection. W.B. Saunders Co. 1994.

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### **Course Notes (Policies and Procedures)**

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### **Assignment Details**



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

*Schedule*

*School of Health Sciences*

*Program: Medical Radiography*

*Option:*

**MRAD 2212**

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

Week of/ Number	Outcome/Material Covered	Reference/ Reading	Assign ment	Due Date
Week 2 Sept. 11 All groups	<b>Course Introduction</b> <ul style="list-style-type: none"><li>• Learning Outcomes</li><li>• References</li><li>• Evaluation</li></ul> <b>Quality Assurance Concepts</b> <ul style="list-style-type: none"><li>• Review of QC Concepts</li><li>• Continuous Quality Improvement (CQI)</li><li>• Equipment for QC</li></ul> <b>QC Tests</b> <ul style="list-style-type: none"><li>• Collimator Test</li><li>• Tomographic Tests<ul style="list-style-type: none"><li>▶ Level Accuracy</li><li>▶ Cut Thickness</li><li>▶ Evaluation of Exposure and Tube Movement</li></ul></li></ul>	Seeram, E. Chapter 19 Handout  Nelson. Handout  Gray, J.  Bushong, S. Chapter 25		
Week 3 Sept. 18 All groups	<b>X-Ray Tubes</b> <ul style="list-style-type: none"><li>• Stationary-Anode Tubes</li><li>• Rotating-Anode Tubes</li><li>• New Anode Disk Technology</li><li>• Recent Developments in X-ray Tube Technology</li></ul>	Bushong, S. Chapter 7, pp. 113–126.		
Week 4 Sept. 25 All groups	<b>X-Ray Tubes (Continued)</b> <ul style="list-style-type: none"><li>• Insulation and Cooling</li><li>• Specialized Tubes for Imaging</li><li>• Tube Rating Charts</li><li>• Common Faults</li></ul>	Bushong, S. Chapter 7, pp. 113–126 pp. 139–143		
	<b>Quiz 1</b>	Based on Week 3 Material (up to Wk.3)		
Week 5 Oct. 2 All groups	<b>X-Ray Circuits</b> <ul style="list-style-type: none"><li>• Primary Circuit<ul style="list-style-type: none"><li>▶ Power Supply</li><li>▶ Line Voltage Compensation</li><li>▶ kV Selection</li><li>▶ X-ray Exposure Switch</li><li>▶ Exposure Timer</li><li>▶ Primary Winding of the High Tension Transformer (HTT)</li></ul></li></ul>	Bushong, S. Chapter 7, pp. 126–133		

Week of/ Number	Outcome/Material Covered	Reference/ Reading	Assign- ment	Due Date
Week 6 Oct. 9 All groups	<b>X-Ray Circuits</b> <ul style="list-style-type: none"> <li>• Secondary Winding of the HTT</li> <li>• mA/mAs meter</li> <li>• Rectification</li> </ul>	Bushong, S. Chapter 7, pp. 133–139		
Week 6 Oct. 9 All groups	<b>Mid Term Examination</b>	Based on topics covered to the end of Week 5		
Week 7 Oct. 16 – AC Oct. 30 – BD	<b>X-Ray Circuits (Continued)</b> <ul style="list-style-type: none"> <li>• Filament Circuit <ul style="list-style-type: none"> <li>▶ Purpose</li> <li>▶ Location</li> <li>▶ Components</li> </ul> </li> </ul>	Thompson, M.A.		
Week 8 Oct. 23 – AC Nov. 6 – BD	<b>QC Tests (Continued)</b> <ul style="list-style-type: none"> <li>• mA linearity</li> <li>• kVp accuracy</li> <li>• mAs repeatability</li> <li>• mR/mAs output</li> <li>• focal spot assessment</li> <li>• inspection procedures for radiography equipment</li> <li>• exposure timer accuracy</li> </ul>	Gray, J. Bushong, S. Chapter 25		
Week 9 Nov. 13 – AC Nov. 27 – BD	<b>X-Ray Generators</b> <ul style="list-style-type: none"> <li>• Purpose</li> <li>• Location</li> <li>• Power Supply</li> <li>• Rating</li> <li>• Types</li> <li>• Applications</li> </ul>	Thompson, M.A.		
Week 10 Nov. 20 – AC	<b>Mammographic Equipment</b> <ul style="list-style-type: none"> <li>• Basis for Mammography</li> <li>• Equipment</li> <li>• Image Receptors</li> </ul>	Bushong, S. Chapter 20, pp. 336–344	Lab report on QC Test	Nov. 20/95
Week 11 Dec. 11 All groups	<b>Final Examination</b>	Review all course notes and readings		