



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**

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

Prerequisites

MRAD 2212 is a Prerequisite for:

Course No.	Course Name	Course No.	Course Name
MRAD 1101	Image Recording, Equipment and Quality Control I	MRAD 3313	Image Recording, Equipment and Quality Control III

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 will allow students to carry out selected QC tests on routine radiographic equipment.

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.

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 **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. 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

Course Record

Developed by: Euclid Seeram, RTR, BSc, M.Sc
Instructor Name and Department (signature)

Date: August 1998

Revised by: _____
Instructor Name and Department (signature)

Date: _____

Approved by: _____
Associate Dean / Program Head (signature)

Start Date: _____



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

Effective Date

September 1998

Instructor(s)

Euclid Seeram, RTR, BSc, MSc

Office No.: SW3 4084
Office Hrs.: As posted

Phone: 8231
e-mail: eseeram@bcit.bc.ca

Text(s) and Equipment

Required:

- Bushong, S. Radiologic Science for Technologists. Mosby-Year Book, Inc. 1997.
- Quality Assurance Concepts — Chapter 19 — In Seeram, E. X-Ray Imaging Equipment. Charles C. Thomas. 1985. pp. 481–498. (Handout)
- Nelson, MT. Continuous Quality Improvement (CQI) in Radiology. Applied Radiology. July 1994. (Handout)

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.

Course Notes (Policies and Procedures)

Assignment Details



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

School of Health Sciences

Program: Medical Radiography

Option:

Schedule

MRAD 2212

Image Recording, Equipment and Quality Control II

Week of/ Number	Outcome/Material Covered	Reference/ Reading	Assignment	Due Date
Week 1 All groups	Course Introduction <ul style="list-style-type: none"> • Learning Outcomes • References • Evaluation X-Ray Tubes <ul style="list-style-type: none"> • Stationary-Anode Tubes • Rotating-Anode Tubes • New Anode Disk Technology • Recent Developments in X-Ray Tube Technology 	Seeram, E. Handout Bushong, S. Chapter 10, pp. 108–124		
Week 2 All groups	X-Ray Tubes (Continued) <ul style="list-style-type: none"> • Insulation and Cooling • Specialized Tubes for Imaging • Tube Rating Charts • Common Faults 	Bushong, S. Chapter 10		
Week 3 All groups	Quality Assurance Concepts <ul style="list-style-type: none"> • Review of QC Concepts • Continuous Quality Improvement (CQI) • Equipment for QC Conventional Tomography QC Tests <ul style="list-style-type: none"> • Collimator Test • Tomographic Tests <ul style="list-style-type: none"> ▸ Level Accuracy ▸ Cut Thickness ▸ Evaluation of Exposure and Tube Movement 	Nelson Handout Gray, J. Bushong, S. Chapter 31 pp. 407–412 Bushong, S. Chapter 22 pp. 282–286	Lab Report on QC Test	
	Quiz 1	Based on Week 3 Material (up to Week 3)		

Week of/ Number	Outcome/Material Covered	Reference/ Reading	Assignment	Due Date
Week 4 All groups	X-Ray Circuits <ul style="list-style-type: none"> Primary Circuit <ul style="list-style-type: none"> Power Supply Line Voltage Compensation kV Selection X-Ray Exposure Switch Exposure Timer Primary Winding of the High Tension Transformer (HTT) Secondary Winding of the HTT mA/mAs Meter Rectification 	Bushong, S. Chapter 9, pp. 91–106		
Week 5 All groups	Mid-Term Examination Date:	Based on topics covered to the end of Week 5		
Week 6	X-Ray Circuits (Continued) <ul style="list-style-type: none"> Filament Circuit <ul style="list-style-type: none"> Purpose Location Components 	Thompson, M.A.		
Week 7	QC Tests (Continued) <ul style="list-style-type: none"> mA Linearity kVp Accuracy mAs Repeatability mR/mAs Output Focal Spot Assessment Inspection Procedures for Radiography Equipment Exposure Timer Accuracy 	Gray, J. Bushong, S. Chapter 22		Lab Report on QC Test Due this week
Week 8	X-Ray Generators <ul style="list-style-type: none"> Purpose Location Power Supply Rating Types Applications 	Thompson, M.A.		
Week 9	Mammographic Equipment <ul style="list-style-type: none"> Basis for Mammography Equipment Image Receptors 	Bushong, S. Chapter 23, pp. 293–302		
Week 10 All groups	Final Examination This exam will be based on the entire course	Review all course notes and readings		