



A POLYTECHNIC INSTITUTION

School of Health Sciences

Program: Medical Radiography

Option:

MRAD 2222**Image Recording, Equipment and Quality Control 2****Start Date:** September, 2006**End Date:****Total Hours:** 14 **Total Weeks:** 7**Term/Level:** 2 **Course Credits:****Hours/Week:** 2 **Lecture:** 2 **Lab:****Shop:** **Seminar:** **Other:****Prerequisites****Course No. Course Name**MRAD 1101 Image Recording, Equipment and
Quality Control 1**MRAD 2222 is a Prerequisite for:****Course No. Course Name**MRAD 3322 Image Recording, Equipment and
Quality Control 3**Course Description**

Through lectures and readings, this course will deal with concepts of digital imaging as well as fluoroscopic principles and equipment. First, the limitations of film-based imaging will be reviewed followed by a description of the nature and advantages of digital image processing. Secondly, the physics and technology of CR will be reviewed followed by a detailed outline of several other characteristics features of CR relating to exposure tolerance, image processing, image quality and artefacts. Finally, the course concludes with a detailed discussion of the principles and instrumentation for fluoroscopic imaging.

Evaluation

Final Examination	50%
Midterm Examination	30%
Report	10%
Quiz (1)	10%
TOTAL	100%

- A grade of 65% is required to pass this course.
- Both examinations are of the multiple choice format.
- The format of the report will be discussed in class.

Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. describe the limitations of film-based imaging
2. describe the general principles of digital x-ray imaging, and digital image processing
3. review the basic physics and technology of Computed Radiography (CR)
4. outline several other characteristics of CR including, exposure tolerance, image processing, image quality, and artifacts.
5. describe the principles of fluoroscopy and describe several characteristic features of fluoroscopic equipment.

Course Learning Outcomes/Competencies (cont'd.)

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.

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.

Verification

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

Faehid Seeram
Authoring Instructor

Sept 01-06
Date

I verify that this course outline has been reviewed.

M. Filippelli
Program Head/Chief Instructor

Sept 1/06
Date

I verify that this course outline complies with BCIT policy.

Allen Bell
Dean/Associate Dean

Sept. 1/06
Date

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

Instructor(s)

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Learning Resources

Required:

- Seeram, E., *Rad Tech's Guide to Equipment Operation and Maintenance*, Blackwell Science, Inc. 2002

Recommended:

- Bushong, S., *Radiologic Science for Technologists*. Mosby-Year Book, Inc. 8th Edition.

Information for Students

(Information below can be adapted and supplemented as necessary.)

The following statements are in accordance with the BCIT Student Regulations Policy 5002. To review the full policy, please refer to: <http://www.bcit.ca/~presoff/5002.pdf>.

Attendance/Illness:

In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with his/her instructor or Program Head or Chief Instructor, indicating the reason for the absence. Prolonged illness of three or more consecutive days must have a BCIT medical certificate sent to the department. Excessive absence may result in failure or immediate withdrawal from the course or program.

Academic Misconduct:

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited and will be handled in accordance with the 'Violations of Standards of Conduct' section of Policy 5002.

Attempts:

Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from their respective program.

Accommodation:

Any student who may require accommodation from BCIT because of a physical or mental disability should refer to BCIT's Policy on Accommodation for Students with Disabilities (Policy #4501), and contact BCIT's Disability Resource Centre (SW1-2300, 604-451-6963) at the earliest possible time. Requests for accommodation must be made to the Disability Resource Centre, and should not be made to a course instructor or Program area.

Any student who needs special assistance in the event of a medical emergency or building evacuation (either because of a disability or for any other reason) should also promptly inform their course instructor(s) and the Disability Resource Centre of their personal circumstances.

Assignment Details

Project Description

(10%)

This project requires that you do a literature search for an article relating to **any of the topics or subtopics cover in this course MRAD 2222**. *Only articles from Journals will be accepted.*

The following is a guide to help you complete this project:

1. Visit the BCIT or Hospital Library
2. Locate an article from a Radiologic Technology/Radiology Journal. Examples of journals include :
 - *Radiology*
 - *Radiographics*
 - *Applied Radiology*
 - *Diagnostic Imaging*
 - *Journal of the Canadian Association of Radiologists*
 - *Seminars in Radiologic Technology*
3. Remember that the article must deal with a topic on equipment or Quality Control
4. Make one copy of the article if necessary. You may want to submit the article with your summary
5. Write a summary of the article based on the following format :
 - Title of the Article
 - Author(s)
 - Journal and Date of Publication
 - Purpose of the Paper (or Study if one was done)
 - Summary of major points presented in the paper
6. Include a copy of the paper if you wish (not mandatory)

Hand this in to Euclid during the last week of class or earlier

Schedule

Week	Material Covered	Reference/Reading
<p>1 and 2 (Both Groups) Wk 1-Sept 4-8 Sept 4 Labour Day</p> <p>Wk 2-Sept 11-15</p>	<p>Course Introduction.</p> <p>Welcome and Discussion of the Course Outline</p> <ul style="list-style-type: none"> • Learning Outcomes • References • Evaluation • Lectures = 2 hours/week <p>Digital Imaging Concepts</p> <ul style="list-style-type: none"> • Film-Based Imaging: Limitation • What is Digital Imaging? • A Rationale for Understanding Digital Image Processing in Radiology • A Generic Digital Image Processing System for Radiology • Image Representation 	<p>Seeram, E. Course Outline</p> <p>Seeram, E.: Digital Image Processing. <i>Radiologic Technology</i>. 2004</p>
<p>3 and 4 (Both Groups) Wk 3-Sept 18-22 Wk 4- Sept 25-29</p>	<p>Digital Imaging Concepts</p> <ul style="list-style-type: none"> • Digital Image Processing Fundamentals <ul style="list-style-type: none"> - Image Digitization - Digital Image Quality - Classes of Digital Image Processing <ul style="list-style-type: none"> *Windowing - Advantages of Digital Image Processing • Anatomy of a Digital Image • Digital Image Processing Techniques: General Concepts <ul style="list-style-type: none"> - Why Digital Image Processing? 	<p>Bushong, Chapter 27 Pages 396-401</p>
<p>4 (Both Groups) Sept 27th</p>	<p>MID-TERM EXAMINATION</p> <p>The exam is based on all materials covered up to Week 4 (first half of topics listed above) and will be held on the second hour of class.</p>	<p>E. Seeram</p>

Week	Material Covered	Reference/Reading
<p>5 and 6 Groups Alternating (CD=Wk Oct 2-6 and CD= Wk Oct 9-13) 1. CD at BCIT from October 2 to Nov 3 2. AB at BCIT from Nov 6 –Dec 8 AB=Wk Nov 6-10 and AB=Wk Nov 13-17</p>	<p>Computed Radiography (CR)</p> <p><i>These topics are a continuation of the materials covered in MRAD 1101.</i></p> <ul style="list-style-type: none"> • CR-A Review of Physics and Technology • Exposure Tolerance • Processing the Digitized Image <ul style="list-style-type: none"> – Pre-acquisition Processing – Post-acquisition Processing • Image Quality Considerations • Image Artifacts 	E Seeram
<p>7 CD=Wk-Oct 16-20 AB=Wk Nov 20-24</p>	<p>Fluoroscopy-Principles and Instrumentation</p> <ul style="list-style-type: none"> • Overview • Special Demands • Fluoroscopic Technique 	<p>Seeram, Chapter 8 Bushong, Chapter 24 Pages 360-369</p>
<p>8 CD=Wk-Oct 23-27 AB=Wk Nov 27th</p>	<p>Fluoroscopy</p> <ul style="list-style-type: none"> • Image Intensification • The Image Intensifier Tube • Multi-field Image Intensification 	<p>Seeram, Chapter 8 Bushong, Chapter 24 Pages 360-369</p>
<p>9 CD=Wk Oct 30-Nov3 AB=Wk Dec 4-8</p>	<p>Fluoroscopy</p> <ul style="list-style-type: none"> • Television Monitoring • Charge Coupled Device • Image Recording • Introduction to Digital Fluoroscopy • Radiation Protection Considerations 	<p>Seeram, Chapter 8 Bushong, Chapter 24 Pages 360-369</p>
<p>Week of Dec 11-15</p>	<p>FINAL EXAMINATION</p>	<p>Seeram, E.</p>
	<p>The final examination is based on the entire course however, the exam will be heavily weighted on topics after the mid-term.</p> <p>Best wishes.</p>	