

## COURSE OUTLINE

**COURSE TITLE:** *“Apparatus & Digital Imaging 2”*

**COURSE CODE:** 142-BYJ-04

**PONDERATION:** 2-2-3

**TARGET COMPETENCIES**

- “Evaluate the performance of a medical imaging machine” (005C-partial)
- “Process a diagnostic image.” (005H-partial)

**COURSE COMPETENCY STATEMENTS:**

- “Analyze HTG specially designed for mobile, cranial and dental x-ray units.”
- “Analyze the principles of operation of tomography and evaluate the quality control test results.”
- “Analyze and evaluate the X-ray tubes rating charts”
- “Evaluate the performance of analog fluoroscopic, PFS and cinefluorographic units.”
- “Describe the basic apparatus and computer hardware/software requirements needed for digital angiographic imaging and interventional procedures.
- “Describe the networking hardware/software requirements needed for archiving, retrieving, displaying, transmitting and recording radiology records.”
- “Describe the QC requirements in a digital imaging radiology environment and perform and analyze the common QC tests.”

**OTHER COURSES REQUIRED TO OBTAIN**

**MINISTERIAL COMPETENCIES:** 142-BYE-03, 142-BYF-03, 142-BYG-03, 142-BZ\*.\*

**COMPONENT:** Technical Studies

**DISCIPLINE:** Radiological Technologies

**PROGRAM:** Diagnostic Imaging (Radiography)

**PROGRAM NUMBER:** 142-A0

**TEACHER:** Roger Caissy

**TELEPHONE:** 514-931-8731 ext. 1547

**E-MAIL:** Moodle (142-BYJ-04)

**DEPARTMENT:** Radiological Technologies

**OFFICE NUMBER:** 5B.0 (Next to College’s Main Entrance)

**OFFICE HOURS** Posted outside office 5B.0, on Moodle + Radtech Bulletin Board.

**SEMINARS:** Before each test as per weekly’s projected sequence.

**FALL 2010**

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## **PRESENTATION OF THE COURSE**

### **Course Description**

#### **Integration**

This course is basically an extension of the *Apparatus & Digital Imaging 1* course (142-BYF-04). Competencies acquired in the second semester course are reinvested and fully integrated into this course, with emphasis placed on the application of principles to clinical situations.

#### **Objective-Standard**

Upon completion of this course, the students will be able to analyze, angiographic, tomographic, mobile (radiographic/fluoroscopic), fluoroscopic, and specialized cranial and dental radiographic equipment. They will acquire the knowledge and essential competency necessary to safely and efficiently operate this equipment, as well as perform quality control testing in these areas.

The students will be able to capture and process analog and digital images from various sources such as imaging plates (IP), radiographs, video and multimedia equipment. They will analyze and evaluate the technical parameters that affect the quality of display monitors. With the use of a CR processor, an x-ray film digitiser and video capture devices, they will digitize analog images and save them on short and long term archiving devices. Using the Internet, PACS, FTP, e-mail and compression programs, they will zip / unzip, upload / download images to and from local / remote sites.

The students will also acquire the knowledge and skills necessary to analyze and process diagnostic digital images.

The student will be able to effectively use the resources available on the Internet and Moodle to complement their learning.

#### **General Content**

The first segment of the course focuses on the basic components and principles of X-ray circuitry in order to understand the principles of operation of the mobile radiographic/fluoroscopic equipment and specialized cranial and dental radiographic units. The students learn the description and quality control evaluation of tomographic, angiographic, and fluoroscopic equipment.

The second segment of the course begins with a review of common computer terminology and the fundamentals of computer operation. Basic terminology and concepts of networking and the Internet are also reviewed. The students analyze the basic principles of data acquisition and digital file management. They evaluate a Digital Picture Archiving and Communication System (PACS). The basic principles of videoconferencing and teleradiography are introduced. The course also includes an analysis of the technical factors/parameters that influence the diagnostic value of the digital image. Some specialized digital imaging techniques are also explored (3D, DSA, road mapping techniques, etc.). The basic concepts and principles of operation of Computed Radiography (CR) and Direct Radiography (DR) are analyzed. The advantages, disadvantages and clinical applications of CR/DR are explored as well.

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## **Main Educational Activities**

### **Relationship to Objective-Standard**

The formative evaluation exercises during and after classes and the structured labs demand active student involvement in all aspects of the course. The learning activities are designed to provide continuous feedback to the students.

### **Teaching Activities**

Subject material is briefly presented using a variety of teaching techniques such as analogies, mnemonics, charts and summary tables. The teacher assists the students as they participate in small groups to complete formative learning activities during classes. Specific explanations with the use of Power Points Presentations and blackboard are given as required. The teacher explains and clarifies the specific objectives. X-ray apparatus, accessory equipment, test tools, and analog and digital image receptors are presented and discussed. The relationship between theory and clinical applications is emphasized. Demonstrations of hardware/software are frequently given.

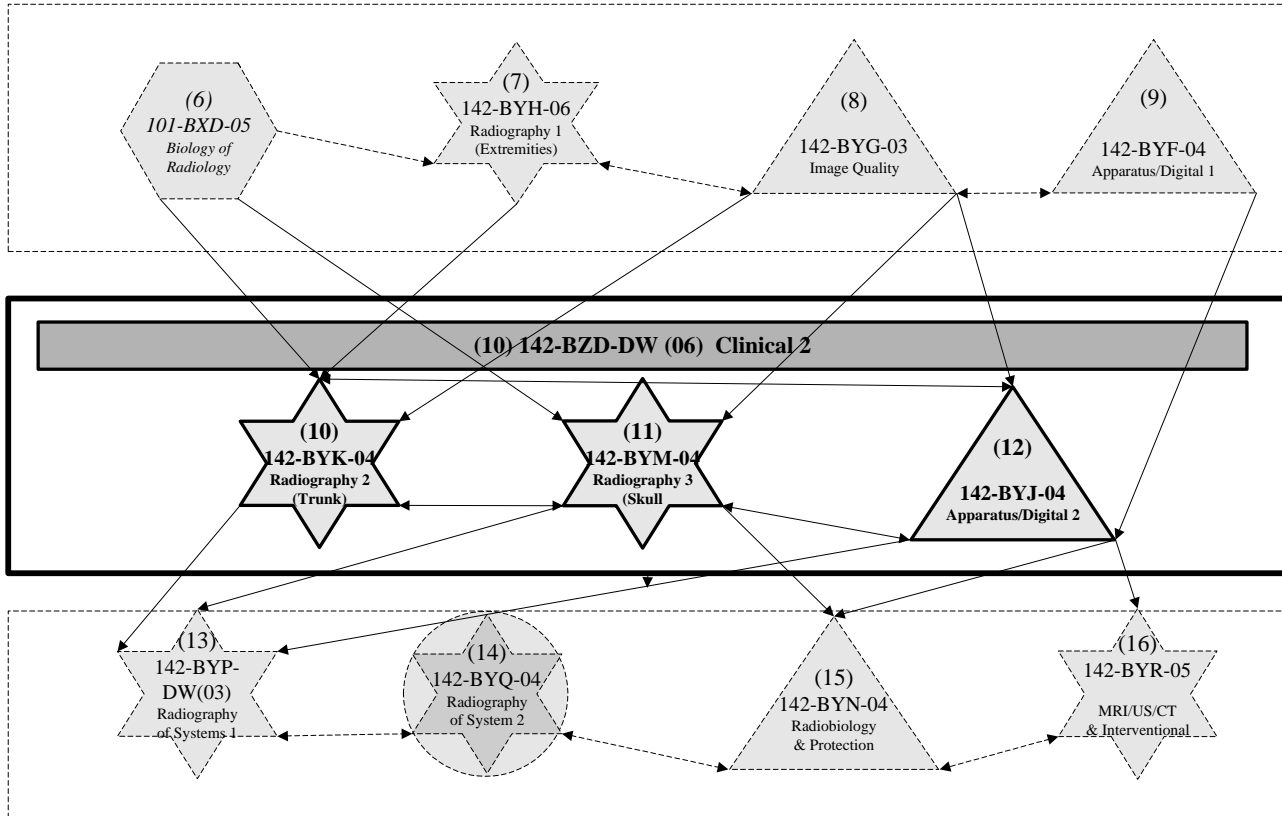
### **Learning Activities**

Worksheets for learning and formative evaluation activities are available for every part of the course. There is a close relationship between the specific objectives, the learning activities and the summative evaluation tests and laboratory activities/assignments. Students must therefore come prepared to classes and labs by reading the required material. With the instruction sheets, they conduct experiments on x-ray apparatus; they collect and analyze data, and evaluate the performance of this equipment; they produce written reports of their experiments in groups of two or three. With the aid of browsers, search engines, FTP/PACS/RIS and Moodle, the students upload/download images. They perform processing and file management exercises on these images. The students also perform formative evaluation exercises, complete crossword puzzles and resolve problems relating to technical factors/parameters.

## **REQUISITES**

- **Absolute pre-requisite:**
  - Apparatus & Digital Imaging 1 (142-BYF-04):
    - Introduction to computer, computer terminology, Windows XP, FTP (FileZilla), and Browser (Mozilla Firefox).
    - Electrical supply.
  - Physics of Radiology (203-BXB-05):
    - Electricity & Magnetism, Optics
- **Recommended pre-requisite:**
  - Image Quality (142-BYG-03):
    - Subjective/objective density, definition, RC, sharpness, noise and distortion.
- **Recommended co-requisite:**
  - Radiography 2 (142-BYK-04) and Radiography 3 (142-BYM-04)

# SITUATION OF THE COURSE WITHIN THE PROGRAM



<b>CODE: 005C</b>	
<b>MINISTERIAL COMPETENCY TITLE: "Apparatus Evaluation"</b>	
<b>Objectives</b>	<b>Standards</b>
<b>Statement of Competency</b>	<b>Achievement Context</b>
<b>Evaluating the performance of a medical imaging machine.</b>	<ul style="list-style-type: none"> <li>• Using the guidelines necessary to achieve radiological, ultrasound and MRI examinations on functional imaging equipment.</li> <li>• Through the use of technical protocols, of cardex, of technical and recording materials, and the necessary control instruments.</li> </ul>
<b>Elements of Competency</b>	<b>Performance Criteria</b>
<b>1. Analyze the principles of construction, operation and use of the machine.</b>	1.1 Precise explanations of the physical characteristics of the basic materials used in the machine's principal components. 1.2 Accurate description of the different stages in transformation of electrical current in the machine. 1.3 Precise explanation of the effect of the exposure factors on the quality of the energy beam as it exits the machine 1.4 Precise explanations of the mechanisms of energy beam transformation.
<b>2. Determine the type and sequence of operations to be performed in evaluating the machine.</b>	2.1 Selection of the technical parameters to be evaluated. 2.2 Selecting the evaluation procedure. 2.3 Selection of the appropriate material. 2.4 Adherence to the steps in the evaluation procedure.
<b>3. Compare the machine's operating limitations to the manufacturer's specifications.</b>	3.1 Selection of relevant data. 3.2 Accurate pinpointing of conflicting parameters. 3.3 Accurate analysis of the results obtained.
<b>4. Describe the abnormalities found.</b>	4.1 Accurate identification of the elements of the problem. 4.2 Soundness of the interrelationships. 4.3 Lucid presentation of the situation.
<b>5. Indicate the probable causes.</b>	5.1 Establishment of a sound relationship between the real and desired situations. 5.2 Well-founded deduction of probable causes. 5.3 Well-founded argumentation.

<b>CODE: 005H</b>	
<b>MINISTERIAL COMPETENCY TITLE: "Process a Diagnostic Image"</b>	
<b>Objectives</b>	<b>Standards</b>
<b>Statement of Competency</b>	<b>Achievement Context</b>
<b>Process a diagnostic image.</b>	<ul style="list-style-type: none"> <li>• From recorded analog information <i>or from a latent image.</i></li> <li>• Using the necessary <i>analog</i> or computer data.</li> </ul>
<b>Elements of Competency</b>	<b>Performance Criteria</b>
<b>1. Analyze the processing techniques required.</b>	1.1 Accurate identification of the expected result. 1.2 Distinguishing the appropriate protocol. 1.3 Adapting the processing techniques 1.4 Accurate analysis of the relation between the expected results and each of the processing techniques.
<b>2. Perform the processing procedures required.</b>	2.1 Proper use of the processing equipment. 2.2 Strict adherence to established protocols and processing techniques. 2.3 Precision in perfecting the image. 2.4 Reducing the effects of artifacts. 2.5 High degree of precision in the measurements, the density readings and annotations.
<b>3. Analyze the processed image.</b>	3.1 Justified critique of the changes made. 3.2 Precise identification of processing errors. 3.3 Accurate deduction of parameters to be corrected. 3.4 Making the appropriate corrections. 3.5 Processing done according to expectations.
<b>4. Transform the digitized image into a latent analogue image.</b>	4.1 Selecting the images to be transferred. 4.2 Using the appropriate commands from the image transfer console to the multiformat camera.
<b>5. <i>Developing the radiographic film.</i></b>	5.1 <i>Respecting darkroom procedure techniques.</i> 5.2 <i>Meticulousness and cleanliness when performing procedural techniques.</i> 5.3 <i>Accurate reading of developing machine gauges.</i> 5.4 <i>Quality of processed images.</i>

\* Parts that are in italics apply mainly to the 142-BYE-03 and/or 142-BYG-03 courses.

**COURSE SEGMENTS:**

<u>Module</u>	<u>Specific Objectives/Content, Teaching/Learning Activities and Formative/Summative Evaluation</u>	
<p>1</p> <p><b><u>Mobile and Cranial X-ray Generators</u></b></p>	<p><b><u>Specific Objectives:</u></b>                      At the end of the <u>first</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Analyze X-ray generators specially designed for mobile radiography, fluoroscopy and for skull radiography.</li> </ul>	<p><b><u>Content:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Mobile</u></li> <li>• <u>Units Cranial and Dental Units</u></li> </ul>
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<p><b><u>Teaching Activities:</u></b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and diagrams.</li> <li>• Identification of essential material.</li> <li>• <b>Answer</b> questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>		<p><b><u>Learning Activities:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course notes and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
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<p><b><u>Summative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Demonstration and structured labs with group and individual report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>		<p><b><u>Formative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>

Module	Specific Objectives/Content, Teaching/Learning Activities and Formative/Summative Evaluation	
<p style="text-align: center;">2</p> <p><b>Conventional Tomography</b></p>	<p><b>Specific Objectives:</b> At the end of the <u>second</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Analyze, evaluate and effectively utilize a table mounted conventional tomography unit.</li> </ul>	<p><b>Content:</b></p> <ul style="list-style-type: none"> <li>• Introduction, basic principles and definitions</li> <li>• Section thickness, tomographic movements, blurring in tomography and zonography</li> <li>• Equipment</li> <li>• Applications, multisection tomography, pantomography and autotomography.</li> </ul>
	<p><b>Teaching Activities:</b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b>Learning Activities:</b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course notes and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b>Summative Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Demonstration and structured labs with group and individual report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b>Formative Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>



Module	Specific Objectives/Content, Teaching/Learning Activities and Formative/Summative Evaluation	
<p style="text-align: center;">3</p> <p><b>Rating of X-ray tubes</b></p>	<p><b><u>Specific Objectives:</u></b>                      At the end of the <u>third</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Analyze and evaluate the features affecting the performance of fixed and rotating anode X-ray tubes used in diagnostic radiology</li> </ul>	<p><b><u>Content:</u></b></p> <ul style="list-style-type: none"> <li>• Cooling of X-ray tubes</li> <li>• Rating of the X-ray tubes</li> </ul>
	<p><b><u>Teaching Activities:</u></b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b><u>Learning Activities:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course notes and other texts. Review specific objectives; identify prerequisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b><u>Summative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Demonstration and structured labs with group and individual report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b><u>Formative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>

Module	Specific Objectives/Content, Teaching/Learning Activities and Formative/Summative Evaluation	
<p style="text-align: center;"><b>4</b></p> <p><b>Fluoroscopy Viewing and Analog Recording</b></p>	<p><b><u>Specific Objectives:</u></b>                      At the end of the <u>fourth</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• analyze and evaluate the performance of standard intensified fluoroscopy and photo-/cine-fluorographic recording units;</li> <li>• Describe the basic requirements for analog radiography / fluoroscopy and analyze the basic imaging functions applied in radiology.</li> </ul>	<p><b><u>Content:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Optics</u>: light, image formation, lenses, cameras and aberration.</li> <li>• <u>Fluoroscopy</u>: types, principles, components, conventional, spot film device, table, image intensifier, monitor, analog &amp; video recording,</li> <li>• <u>PFS/cine</u>: components, types of cameras, applications advantages/disadvantages, special requirements.</li> </ul>
	<p><b><u>Teaching Activities:</u></b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b><u>Learning Activities:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs</u>: readings from course notes and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs</u>: discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs</u>: completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b><u>Summative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Demonstration and structured labs with group and individual report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b><u>Formative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>

Module	Specific Objectives/Content, Teaching/Learning Activities and Formative/Summative Evaluation	
<p style="text-align: center;">5</p> <p><b>Digital Subtraction Angiographic Equipment</b></p>	<p><b>Specific Objectives:</b> At the end of the <u>fifth</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• analyze the major and accessory equipment used for digital imaging / interventional angiography.</li> </ul>	<p><b>Content:</b></p> <ul style="list-style-type: none"> <li>• Introduction, basic principles and definitions</li> <li>• Still, serial and dynamic imaging.</li> <li>• Generator specifications</li> <li>• Injectors and specialized tables</li> </ul>
	<p><b>Teaching Activities:</b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b>Learning Activities:</b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course notes and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b>Summative Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Demonstration and structured labs with group and individual report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b>Formative Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>

Module	Specific Objectives/Content, Teaching/Learning Activities & Formative/Summative Evaluation	
<p style="text-align: center;"><b>6</b></p> <p><b>Applied Digital Imaging in Radiology</b></p>	<p><b><u>Specific Objective:</u></b> At the end of the <u>sixth</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• describe the fundamental concepts of computers and digital imaging and networking technology;</li> <li>• effectively utilize the computer hardware/software resources available at the college;</li> <li>• recognize and effectively access the diversity and the richness of Radiology-related knowledge available on the Internet;</li> <li>• Describe the basic requirements for digital radiography/fluoroscopy and analyze the basic digital file management and imaging functions applied in radiology.</li> </ul>	<p><b><u>Content:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Digital Radiology:</u> display, memory management, and data transmission/networking and communication.</li> <li>• Image analysis/processing techniques.</li> <li>• Evaluation of a digital image.</li> <li>• Advanced image processing: virtual reality, 3D and multimodality reconstructions.</li> <li>• Clinical applications of the Internet, videoconferencing and telemedicine / teleradiography. SPR, DF and DSA.</li> <li>• CR and DR.</li> <li>• DICOM and PACS.</li> <li>• RID, RUIS, RIS, HIS</li> <li>• The future of Digital Imaging in Radiology.</li> </ul>
	<p><b><u>Teaching Activities:</u></b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and overhead diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b><u>Learning Activities:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course manual and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b><u>Summative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Structured labs with group report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b><u>Formative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness of the teaching and the learning activities.</li> </ul>

Module	Specific Objectives/Content, Teaching/Learning Activities & Formative/Summative Evaluation	
<p style="text-align: center;"><b>7</b></p> <p><b>Quality Assurance and Quality Control</b></p>	<p><b><u>Specific Objective:</u></b> At the end of the <u>fourth</u> module, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Perform/evaluate QC testing of X-ray generators, conventional radiographic and fluoroscopic units and accessory equipment.</li> </ul>	<p><b><u>Content:</u></b></p> <ul style="list-style-type: none"> <li>• QC programs, equipment parameters, test equipment and technique charts relating to HTG and tomographic &amp; fluoroscopic equipment.</li> <li>• Analyse and perform QC tests specific to CR, DF.</li> <li>• Evaluate the performance of monitors with the use of the SMPTE and TG-18 QC templates.</li> </ul>
	<p><b><u>Teaching Activities:</u></b></p> <ul style="list-style-type: none"> <li>• Present summary of material.</li> <li>• Explanation of course notes and overhead diagrams.</li> <li>• Identification of essential material.</li> <li>• Answer questions.</li> <li>• Relate to clinical situations.</li> <li>• Provide support during activities.</li> </ul>	<p><b><u>Learning Activities:</u></b></p> <ul style="list-style-type: none"> <li>• <u>Before classes/labs:</u> readings from course manual and other texts. Review specific objectives; identify pre-requisite objectives/contents that must be reviewed.</li> <li>• <u>During classes/labs:</u> discussion, listening, note taking, problem solving, completion of learning activities in groups; working effectively as a member of a team in the lab.</li> <li>• <u>After classes/labs:</u> completion of assigned reading/lab reports; monitor self-progress and seek assistance during office hours as needed.</li> </ul>
	<p><b><u>Summative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Structured labs with group report writing.</li> <li>• Test and final exam: similar format to the learning activities.</li> </ul>	<p><b><u>Formative Evaluation:</u></b></p> <ul style="list-style-type: none"> <li>• Complete all learning activities. Prepare questions to ask the teacher.</li> <li>• Seek/provide peer assistance.</li> <li>• Provide feedback to teacher regarding the effectiveness teaching and learning activities.</li> </ul>

## SPECIFIC OBJECTIVES

The specific objectives for each course module/chapter are part of the course manual.

## **LEARNING ACTIVITIES**

- Formative evaluation activities (Learning Activities) will be available at the end of each chapters of the course notes. They will consist mainly of short answer questions, crossword puzzles and calculation exercises when they apply. These learning activities are designed to help the students evaluate their progress throughout the term. By completing them, the students will greatly improve their chance of success on the summative evaluations (tests / final exam).
- A password to access the answer sheets for the Learning Activities will be given once they have been completed.

## **SPECIFIC CONTENT AND LEVEL OF IMPORTANCE**

- The levels of importance (A, B or C) will be provided for each slide of the chapter notes:

*"A" = Essential", "B" = Important, and "C" = Helpful.*

- Students should also refer to the specific course objectives to guide them as they study for tests.

## EVALUATION

Tests - 60%	Labs/Learning Activities – 15%	Final Exam - 25%
<ul style="list-style-type: none"> <li>• <b>Test 1</b> 20 % (Review, Chap. 1, 2, 3,4 &amp; Lab 1)</li> <li>• <b>Test 2</b> 20 % (Chap. 5, 6, 7, 8 &amp; Lab 2 )</li> <li>• <b>Test 3</b> 20 % (Chap. 9, 10,11, &amp; Labs 3/4)</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Tests will consist of SA &amp;/or MC questions. A breakdown will be available preceding each test.</li> </ul>	<p><b>Labs: (Groups of 2 or 3)</b></p> <p><b>Lab #1</b> 2% Tomography <b>Deadline:</b> H-09/23, 4:00 p.m.</p> <p><b>Lab # 2:</b> 3% Fluoroscopy / kVp <b>Deadline:</b> H-10/21, 4:00 p.m.</p> <p><b>Labs #3 &amp; #4:</b> 4% Digital Imaging <b>Deadline:</b> H-11/25, 4:00 p.m.</p> <p><b>Lab Format/Report:</b></p> <ul style="list-style-type: none"> <li>• Lab sheets will be available a few days before the lab.</li> <li>• <b>Group Report for Labs 1 &amp; 2:</b> same format as the Basic Radiographic Imaging course. Experimentation and report writing to be done in groups of 2 or 3.</li> <li>• <b>Individual Report for Labs 3 &amp; 4:</b> Submission of answers to questions (verification of work done). An answer sheet will be available on Moodle.</li> </ul> <p><b>Learning Activities (individual):</b> <b>Format:</b> short answers mainly</p> <p>A. Review, Chap. 1, 2, 3 &amp; 4 (Incl. Course Manual p. 58-66) 2% <b>Deadline:</b> W-09/22, 2:30 p.m.</p> <p>B. Chap. 5, 6, 7 &amp; 8: 2% <b>Deadline:</b> W-10/27, 2:30 p.m.</p> <p>C. Chap.9, 10 &amp; 11: 2% <b>Deadline:</b> W-12/01, 2:30 p.m.</p> <p><i>N.B. Late submission of lab/LA will result in a 50% reduction of the grade.</i></p>	<p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• 90-100 MC Questions</li> <li>• Duration: 3 hrs.</li> <li>• Includes all Course Contents &amp; Labs.</li> </ul>

**PROJECTED SEQUENCE: CLASSES / TESTS / LABS**

Week	DATE	CLASSES, LABS, TESTS & SEMINARS	DEADLINES
1	H-08/26	<ul style="list-style-type: none"> <li>Course Plan &amp; Review of BZB/BXB/BYE/BYF courses</li> </ul>	
2	M-08/30 H-09/02	<ul style="list-style-type: none"> <li>Chap. 1: Portable/Mobile X-ray Units &amp; Chap. 2 : Cranial/ Dental Units</li> <li>Chap. 3: Tomography</li> </ul>	
3	<b>M-09/06</b> M(H)-09/09	<ul style="list-style-type: none"> <li><b>HOLIDAY</b></li> <li>Chap.3: Tomography (cont'd)</li> </ul>	
4	M-09/13 H-09/16	<ul style="list-style-type: none"> <li>Review of X-ray tubes &amp; Chap. 4: Thermal Rating</li> <li><b>LAB 1:</b> Tomography (2%), 4A-11 &amp; 4A-15</li> </ul>	
5	M-09/20 W-09/22 H-09/23	<ul style="list-style-type: none"> <li>Chap. 4: Thermal Rating of the X-ray tube</li> <li><b>SEMINAR 1 (14:30 -16:00) Room 4A.5</b></li> <li>Chap. 5 Optics/Cameras</li> </ul>	<ul style="list-style-type: none"> <li>LA - A</li> <li>Lab 1 Report</li> </ul>
6	M-09/27 H-09/30	<ul style="list-style-type: none"> <li>Chap. 6: General Fluoroscopic Components</li> <li><b>TEST #1:</b> Review, Chapters 1, 2, 3, 4 + Lab 1 (20%)</li> </ul>	
7	M-10/04 H-10/07	<ul style="list-style-type: none"> <li>Review Test 1 &amp; Chap. 7: Image Intensification</li> <li>Chap. 7: Image Intensification (cont'd)</li> </ul>	
8	<b>M-10/11</b> M(W)-10/13 H-10/14 (F-10-15)	<ul style="list-style-type: none"> <li><b>HOLIDAY</b></li> <li>Chap. 7: Image Intensification (cont'd)</li> <li><b>LAB 2:</b> kVp &amp; Fluoroscopy (3%), 4A-11</li> <li><b>PED DAY</b></li> </ul>	
9	M-10/18 H-10/21	<ul style="list-style-type: none"> <li>Chap. 8: PFS/Cine Cameras (cont'd)</li> <li>Chap. 8: PFS/Cine Cameras</li> </ul>	<ul style="list-style-type: none"> <li>Lab 2 Report</li> </ul>
10	M-10/25 W-10/27 H-10/28	<ul style="list-style-type: none"> <li>Review of Computers &amp; Chap. 9: Intro. to Digital Imaging</li> <li><b>SEMINAR 2 (14:30 -16:00) Room 4A.5</b></li> <li>Chap. 9: Intro. to Digital Imaging (cont'd)</li> </ul>	<ul style="list-style-type: none"> <li>LA - B</li> </ul>
11	M-11/01 H-11/04	<ul style="list-style-type: none"> <li>Chap. 9: Intro. to Digital Imaging (cont'd)</li> <li><b>TEST #2:</b> Chap. 5, 6, 7 + Lab 2 (20%)</li> </ul>	
12	M-11/08 H-11/11	<ul style="list-style-type: none"> <li>Review Test 2 &amp; Chap. 10: Digital Imaging Modalities in Radiology (cont'd)</li> <li><b>LAB 3:</b> Digital Imaging (Acquisition) (2%), 4A-11 &amp; 4A-15</li> </ul>	
13	M-11/15 H-11/18	<ul style="list-style-type: none"> <li>Chap. 10: Digital Imaging Modalities in Radiology (cont'd)</li> <li><b>LAB 4:</b> Digital Imaging (Processing) (2%), 4A-11 &amp; 4A-15</li> </ul>	
14	M-11/22 H-11/25	<ul style="list-style-type: none"> <li>Chap. 10: Digital Imaging Modalities in Radiology (cont'd)</li> <li>Chap. 10: Digital Imaging Modalities in Radiology (cont'd)</li> </ul>	<ul style="list-style-type: none"> <li>Lab 3/4 Report</li> </ul>
15	M-11/29 W-12/01 H-12/02	<ul style="list-style-type: none"> <li>Chap. 11: Networking in Medicine</li> <li><b>SEMINAR 4(14:30 -16:00) Room 4A.5</b></li> <li>Chap. 11: Networking in Medicine (cont'd)</li> </ul>	<ul style="list-style-type: none"> <li>LA - C</li> </ul>
16	M-12/06 H-12-09	<ul style="list-style-type: none"> <li>Chap. 11: Networking in Medicine (cont'd) &amp; Course/Teacher Evaluation</li> <li><b>TEST #3:</b> Chap. 9, 10, 11 + Lab 3 &amp; 4 (20%)</li> <li><b>Note:</b> Review of Test 3 will be done during the Seminar for Final Exam (TBA)</li> </ul>	

- This is a “projected” sequence that will be followed as closely as possible. Request to change test dates can be made; however, a signed agreement by all students and teacher will be required.



## MEDIAGRAPHY

MEDIA	REFERENCES	COMMENTS
<p><b>Manuals/ Books</b></p>	<p>1- <u>Apparatus &amp; Digital Imaging 2</u>, by R. Caissy, Fall 2010</p> <p>2- <u>Apparatus &amp; Digital Imaging 1</u>, by R. Caissy &amp; S. Houle, Winter 2010.</p> <p>-----</p> <p>3- <u>Radiologic Science for Technologists</u>, by S.C. Bushong, 9<sup>th</sup> Ed. 2008.</p> <p>4- <u>Basic Radiographic Imaging</u> course manual, by Roger Caissy, Fall 2009.</p> <p>5- <u>Image Quality</u> course manual, by Roger Caissy, Winter 2010.</p> <p>6- <u>Safety Code 35</u>, CCRPB, Health Canada, Aug. 2008.</p>	<p><u>Required</u></p> <p><u>Required</u></p> <p>-----</p> <p>Required</p> <p>Required</p> <p>Required</p> <p>Required (Pdf version available on Moodle)</p>
<p><b>Other References</b></p> <p>(Available at the College and/or Radiology libraries)</p>	<p>7- <u>Standards of Practice in Radiodiagnostic OTIMRO</u>, 2006.</p> <p>8- <u>Quality Management in the Imaging Sciences</u>, by Jeffrey PAPP, 3rd Ed., 2006, Mosby</p> <p>9- <u>Quality Control in Diagnostic Imaging</u>. By J. Gray.</p> <p>10- Chesney’s <u>Equipment for Student Radiographers</u>, 4<sup>th</sup> Ed. by P.H. Carter., 1994</p> <p>11- <u>The Essential Physics of Medical Imaging</u>, 2<sup>nd</sup> Ed. J.T. Bushberg. 2002.</p> <p>12- <u>Rad Tech’s Guide to Equipment Operation and Maintenance</u>, by Euclid Seeram, 2001.</p> <p>13- <u>Christensen's Physics of Diagnostic Radiology</u> by Curry, &amp; Dowdey.</p> <p>14- <u>Principles of Imaging Science and Protection</u>, by Thompson</p> <p>15- <u>Principles of Radiographic Imaging</u> by Carlton / McKenna / Adler.</p> <p>16- <u>Radiographic Photography and Imaging Processes</u> by David Jenkins.</p> <p>17- <u>Merrill’s</u>, Volume III, by P.W. Ballinger, 7th Edition.</p> <p>18- <u>The Computer in Radiology</u>, by Hunter.</p> <p>19- <u>Computed Tomography for Technologists</u>, by Lois E. Romans, Lippincott, 2011</p>	<p>These references are helpful if you need to explore a specific topic.</p>
<p><b>Moodle</b></p>	<p><a href="http://moodle.dawsoncollege.qc.ca">http://moodle.dawsoncollege.qc.ca</a></p>	<p>Required</p>

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## POLICIES

1. **Academic Standing & Advancement Policies:** The Radiology Technologies Department Academic Standing and Advancement Policies, as well as the College Policies and Regulations as specified in the current calendar apply for this course. The Radiology Technologies Department Policies, however, take precedence over the College Policies in areas of conflict.
2. **Participation:** during the semester the student is expected to actively participate in classes and labs, and to utilize available learning aids - reference books, radiology lab facilities. Moodle is a course requirement.
3. **Punctuality** is essential for lectures and labs. In order to minimize class disruption, late students will only be allowed to enter the class after the first half-hour. Late students will also be required to indicate that they were late on the sign-in attendance sheet. Students who are late more than a half-hour will not be permitted to enter the class. Students who are late more than 5 minutes to a lab will be refused entrance. The teacher reserves the right to refuse entrance to the class for students who are frequently late (more than 5 incidences) or fail to declare their lateness on the sign-in sheet.
4. **Attendance** will be recorded. Attendance in laboratories is mandatory. Students who are absent for any laboratory activity will receive a 0% grade for the laboratory report/assignment. Students who are absent for more than 50% of lecture periods will not be eligible to write the final exam, and may therefore fail the course. Absences may be excused only with justification as described in the Student Evaluation Policy (ISEP) which is available on the College web site. There will be no opportunity to make up a missed lab unless policy #5 is respected. A record of attendance will be available on Moodle. You should notify your teacher through Moodle if you will be absent for several classes.
5. **Tests, Labs and Learning Activities:** Any student missing a Test / Lab without prior warning and without valid documented illness or other exceptional circumstance will be given 0% for that Test/Lab. A written justification, such as a medical note, must state that you were not fit to write the compulsory evaluation.
6. **Learning Activities (LA):** Failure to submit a LA / lab report on time will result in a 50% reduction of its mark. Some LA will be done in class. You may work together in completing these activities. The password to access the answer sheet of each group of LA (A/B/C) will be available on Moodle once evidence of completion has been shown to the teacher. These passwords must not be given to your peers. If you submit your LA to the teacher in class, they will be returned to you at the next class or during office hours. Make sure to staple the LA pages and write your name on the front page.
7. **Cheating:** In this department, cheating is viewed as a serious academic offense. Any incidence of cheating will result in a mark of "0" for the test/lab/project/activity or failure in the course. A recommendation for being expelled from the program may also be made to the Academic Dean. Please see the Department's Academic Regulations, section 4.6 for more details. The Senate Cheating Policy described in the Dawson College Timetable will also apply to this course.
8. **Literacy:** Since concise accurate expression is an integral part of science and technology courses, tests and/or lab reports will include evaluation of the student's communication skills as per the Radiology Technologies Department Academic Regulations. Students will be asked to answer questions using complete sentences which demonstrate their ability to present information clearly and concisely.
9. **Religious Holidays:** Students who wish to observe religious holidays must inform the teacher, in writing, by the 2<sup>nd</sup> week of term of his/her intent so that alternate arrangements can be made, if necessary.
10. **I.S.E.P.:** This course plan has been prepared in conformity with the Institutional Student Evaluation Policy (I.S.E.P.). The "Policy is designed to promote equitable and effective evaluation of student learning" and is **therefore a crucial policy for you to read and understand**. The policy describes the rights and obligations of students, faculty, departments, programs, and the College administration with regard to evaluation in all courses. **I.S.E.P.** is published in the College Calendar and reference copies are available in the Library and in the offices of program Chairs and the Dean of Science, Medical Studies & Engineering.