



A POLYTECHNIC INSTITUTION Course Outline

School of Computing and Academic Studies
 Program: Medical Radiography
 Option:

Phys 1275
 Physics: Medical Radiography 1

Start Date: January 06 2003

End Date: April 17 2003

Total Hours: 49 **Total Weeks:** 14

Term/Level: 1 **Course Credits:** 3

Hours/Week:

3.5 **Lecture:** 2.5 **Lab:** 2 **Shop:** **Seminar:** **Other:**

Prerequisites

REF CourseNo \h * MERGEFORMAT Phys 1275
 is a Prerequisite for:

Course No.	Course Name
FORMTEXT 12	FORMTEXT Physics 12 and Math

Course No.	Course Name
FORMTEXT	FORMTEXT Physics: Medical Radiography 2
Phys 2285	

n Course Description (required)

Physics of Medical Radiography (1275/2275/3275) is an introductory level course that emphasizes the application of physical phenomena in medical radiography. Topics include structural and physical properties of matter, static electricity, direct and alternating current, magnetism, energy, heat, wave motion, electromagnetic radiation, quantum concepts, production of X-rays, interaction of X-rays with matter, and digital imaging. Wherever appropriate, the physics of devices such as X-ray tubes, the generator, ionization chamber, photomultiplier tube, TLD, imaging devices etc., will be used to demonstrate applied physics concepts.

n Evaluation

Term Test	40%
Laboratory Reports	10%
Laboratory Test	10%
Final Exam	40%
TOTAL	100%

Comments: A mark of 60% is required to pass the course.

n Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

- define relevant physics terms with units,
- explain or discuss relevant physics concepts with defined terminology,

- draw and label diagrams for relevant applied physics topics,
- demonstrate conceptual understanding of physics by solving numerical, subjective and objective problems,
- explain the radiographic image formation process to a patient

Competency profile

This course provides a foundation of applied science for the Radiography program, and in the process, covers a portion of the following competencies:

- A2.6, A4.2, A4.10, A5.4, A5.6, A5.7, A5.8, A7.5, A7.7
- B1.5, B1.6, B1.7, B1.8, B2.1, B2.2, B2.3, B2.5, B3.2, B3.3, B4.1, B4.2, B5.1, B5.2, B5.3
- C2.4, C2.7
- D1.13, D1.14, D2.2, D3.1, D3.2

n Verification

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

Authoring Instructor

Date

I verify that this course outline has been reviewed.

Program Head/Chief Instructor

Date

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean

Date

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

n Instructor(s)

Kevin Dunphy, Ph.D.

Office Location: SW3-4079

Office Phone: 451-7136

Office Hrs.: TBA

E-mail Address: KDUNPHY@BCIT.CA

n Learning Resources

Required:

Bushong, Stewart C., *Radiologic Science for Technologists: Physics, Biology and Protection*, sixth edition, Mosby, (1997).

A Manual of Experiments in Medical Radiography Technology

Recommended:

Scientific calculator

n Information for Students

Passing Grade: The passing grade in this course is 60%

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

Makeup Tests, Exams or Quizzes: There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

Ethics: BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.

Attendance: The attendance policy as outlined in the current BCIT Calendar will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

Illness: A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects, or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

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 the appropriate program.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

Program: *Medical Radiography*
 Course Delivered by: *Physics Department*
 School of *Computing and Academic Studies*

Schedule For:
PHYS 1275
Physics: Medical Radiography I

This schedule is subject to change at the discretion of the instructor.

Chapter	Topics	Reference
1	<p>Introduction 1 period (# of periods is an estimate only)</p> <ul style="list-style-type: none"> • Course objectives • Measurements SI units accuracy and precision • <i>Unit conversion</i> 	
2	<p>Radiological Physics 2 periods</p> <ul style="list-style-type: none"> • <i>Historical background</i> • X-ray generation (brief overview) simplified circuit definitions (mA, kV, time, collimator, grid and screen) x-ray production x-ray attenuation 	

3	<p>Structure of Matter 2 periods</p> <ul style="list-style-type: none"> • Atomic structure protons, neutrons, electrons • Atomic energy level diagram binding energy ionization energy excited states electron transition • Photon energy • Tungsten atom • Radioactivity α, β and γ radiation biological effects • Applications gamma camera <i>PET scanner</i> 	
4	<p>Electrostatics 3 periods</p> <ul style="list-style-type: none"> • Electric charges (review) types of charges interaction of charges methods of ionization • Electrostatic field electric field lines of force • Electrostatic applications to Radiography x-ray tube focusing cup static marking of films operating room hazards • Electric potential (voltage) • Equipotential lines • Electron volt energy unit 	
5	<p>Electric Current 4 periods</p> <ul style="list-style-type: none"> • Charge transfer battery electric current • Circuits current, voltage and resistance energy and power internal resistance • Line voltage drop 	

6	<p>Capacitance 2 periods</p> <ul style="list-style-type: none"> • Capacitor definition construction • Charging and discharging a capacitor • Application filtration exposure timing 	
7	<p>Magnetism 3 periods</p> <ul style="list-style-type: none"> • Nature of magnetism applications in radiography (MRI) • Electromagnetic induction • Transformers construction operating principle types of transformers 	
8	<p>AC Circuits 2 periods</p> <ul style="list-style-type: none"> • Ohm's Law and AC peak, average and effective (RMS) advantages of using AC • Rectification full wave 	
9	<p>Solid State 3 periods</p> <ul style="list-style-type: none"> • Solids • Energy bands conductors insulators semiconductors • Solid state diodes rectifiers X-ray detectors • Applications fluorescence (scintillation) phosphorescence thermoluminescent dosimeters imaging plate 	

10	<p>X-ray Generators 3 periods</p> <ul style="list-style-type: none"> • Single phase • Three phase voltage generator voltage wave-form • <i>Three-phase rectification</i> <i>6-pulse</i> <i>12-pulse</i> <i>percent ripple</i> • <i>High-frequency generators</i> <i>constant kV</i> • <i>Grid controlled X-ray tubes</i> 	
11	<p>X-ray Production 2 periods</p> <ul style="list-style-type: none"> • Characteristic production • Brems Production • Spectral Intensity Curve x-ray quality x-ray quantity change produced by mA and kV 	
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