BCIT POLYTECHNIC INSTITUTION

Course Outline

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

Phys 1275
Physics: Medical Radiography 1

Start Date:	January 5			**End Date:**	April 21		
Total Hours:	63	**Total Weeks:**	14	**Term/Level:**	1	**Course Credits:**	3
Hours/Week:	4.5	**Lecture:**	2.5	**Lab:** 2	**Shop:**	**Seminar:**	**Other:**

Prerequisites:

Course No.	Course Name
	Physics 12 and Math 12

Phys 1275 is a prerequisite for:

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

■ Course Description (required)

Physics of Medical Radiography 1 (1275) is an introductory level course that emphasizes the application of physical phenomena in medical radiography. Topics include structural and physical properties of matter, electromagnetic radiation, electrostatics, direct and alternating current circuits, magnetism, solid state physics, and production of x-rays. The physics of x-ray tubes and the x-ray generator components will also be discussed.

■ Evaluation

Quizzes	15%	Comments: A mark of 65% is required to pass this course
Term Tests (2)	30%	
Laboratory Reports	10%	
Laboratory Test	10%	
Final Exam	35%	
TOTAL	100 %	

■ Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

- perform relevant numerical calculations with careful attention to units throughout
- apply basic physical concepts in the nature of light to calculate wavelength, frequency and energy of a photon
- describe the structure of matter using appropriate terms and diagrams
- describe and perform calculations relating to static electricity, including electrostatic repulsion and attraction, electric fields, electrostatic charging, and electric potential

- describe and perform calculations dealing with DC circuits, including Ohm's law, series and parallel circuits, energy and power
- describe and perform calculations dealing with magnetism, including sources of magnetic fields, magnetic properties of matter, electromagnets, and mutual induction (transformers)
- describe and perform calculations relating to AC circuits
- describe and draw labelled diagrams for relevant topics relating to solid state physics
- compare single phase, three phase and high frequency x-ray generators, with respect to the voltage ripple produced
- describe the physical meaning of x-ray technique factors
- describe modes of X-ray production, and calculate energies of Bremsstrahlung and characteristic X-rays

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

Verification

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

J Tal — Authoring Instructor

Jan 4, 2006 — Date

I verify that this course outline has been reviewed.

F. D'Agostino — Program Head/Chief Instructor

January 4, 2006 — Date

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

Instructor(s): X

J. Talman, M.Sc. Office Location: SW3 - 4083 Office Phone: 451-7151
Office Hours: TBA e-Mail Address: jtalman@bcit.ca

Learning Resources

Required:

- Bushong, Stewart C., *Radiologic Science for Technologists: Physics, Biology and Protection*, 7'th edition, Mosby, (2001).
- A Manual of Experiments in Medical Radiography Technology

Recommended:

- Scientific calculator (bring to every lecture)

Information for Students

Passing Grade: The passing grade in this course is 65%. The final mark is a weighted average of all tests and lab work.

Laboratory Reports: will be completed each week and graded by an instructor. **Students must complete the laboratory exercises and hand in finished reports on time to obtain a grade.** No marks will be given for experiments from which you were absent, except by special arrangement with instructor.

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 make up 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 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.

Schedule

Week(s) of	Outcome/Material Covered	Reference/ Reading
Jan 4	**Introduction** • Course objectives • Measurements SI units and prefixes Scientific notation • Unit conversion	Course notes Bushong, pp 27-29
Jan 9	**Radiological Physics** • Historical background • X-ray generation (brief overview) simplified circuit definitions (mA, kV, time, collimator, grid and screen) x-ray production • electromagnetic radiation	Course notes, Bushong, pp 3-9 Bushong, Ch 5
Jan 16	**Structure of Matter** • 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 • Applications gamma camera • PET scanner	Course notes Bushong, Ch 4
Jan 23, Jan 30	**Electrostatics** • 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	Course notes Bushong, Ch 6

Feb 6, Feb 13	**Midterm 1:February 8** **Electric Current** • Charge transfer battery electric current • Circuits current, voltage and resistance energy and power internal resistance • Line voltage drop	Course notes Bushong, Ch 6
Feb 20	**Capacitance** • Capacitor definition construction • Charging and discharging a capacitor • Application Filtration exposure timing	Course notes
Feb 27	**Magnetism** • Nature of magnetism applications in radiography (MRI) • Electromagnetic induction • Transformers construction operating principle types of transformers	Course notes Bushong, Ch 7,8
Mar 6	**AC Circuits** • Ohm's Law and AC peak, average and effective (RMS) advantages of using AC • Rectification full wave half wave	Course notes
Mar 20, Mar 27	**Midterm 2: Mar 22** **Solid State** • Solids • Energy bands conductors insulators semiconductors • Solid state diodes rectifiers X-ray detectors • Applications fluorescence (scintillation) phosphorescence thermoluminescent dosimeters imaging plate	Course notes

Apr 3	**X-ray Generators** • Single phase • Three phase voltage generator voltage wave-form • Three-phase rectification 6-pulse 12-pulse percent ripple • High-frequency generators	Course notes Bushong, pp 112-119
Apr 10	**X-ray Production** • Characteristic production • Brems Production	Course notes Bushong, pp 141-146