BCIT®

A POLYTECHNIC INSTITUTION

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

Physics 2285
Physics: Medical Radiography 2

Start Date:	September 3 /0**2**		**End Date:**	December 14	

Total Hours:	21	**Total Weeks:**	7		**Term/Level:**	2	**Course Credits:**	1.5
Hours/Week:	3	**Lecture:**	1	**Lab:** 2	**Shop:**		**Seminar:**	**Other:**

Prerequisites		**Physics 2285 is a Prerequisite for:**	
Course No.	**Course Name**	**Course No.**	**Course Name**
Physics 1275	Physics Medical Radiography 1	Physics 3385	Physics Medical Radiography 3

v 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 devises such as X-ray tubes, the generator, ionization chamber, photomultiplier tube, TLD, imaging devices etc., will be used to demonstrate applied physics concepts.

v Evaluation

Term Test	35%	Comments:
Laboratory Reports	25%	
Final Exam	40%	
TOTAL	100%	

v Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

- define relevant physics terms with units,
- explain and discuss relevant x-ray physics concepts with defined terminology,
- draw and label diagrams for relevant applied x-ray physics topics,
- demonstrate conceptual understanding of x-ray physics by solving 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

v 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.

v Instructor(s)

K. Dunphy PhD.

Office Location: SW3-4079
Office Hrs.: TBA

Office Phone: 451-7136
E-mail Address: Kdunphy@bcit.ca

v 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:

- Ball, J.L. and A.D. Moore, *Essential Physics for Radiographers*, second edition, Blackwell, (1986).

- Carlton, R.R. and A.M. Adler, *Principles of Radiographic Imaging: an art and a science*, Delmar Publishers, (1992).

- Hay and Hughes, *First-Year Physics for Radiographers*, second, Bailliere Tindall, (1978).

- Thompson, Hall, Hattaway and Dowd, *Principles of Imaging Science and Protection*, W.B. Saunders, 1994.

- Wilks, *Principles of Radiological Physics*, Churchill Livingston, (1981).

- Wolbarst, A.B., *Physics of Radiology*, Appleton and Lange, 1993.

v Information for Students

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

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

Final Exam: will test material covered in the whole term.

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.

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

Chapter in Notes	Topics	Reference /Reading

1	**X-ray Production**
	
	• Review:
	   • Electron-Target Interactions
	      Heat production
	      Back-scatter
	      Brems x-ray production
	      Characteristic x-ray production
	   • X-ray Spectrum
	      Brems
	      Characteristic
	      Total x-ray spectrum
	   • Energy Level Diagram
	• Relative Importance of Brems and Characteristic
	• Total X-ray Power (X-ray Output)
	• X-ray Production Efficiency
	• The 15% Rule
	• X-ray Beam Quality and Quantity (Review)
	• Changing the X-ray Spectrum (Review)
	      mA
	      kV
	      target
	      filtration
	      voltage wave-form
		Bushong:
		• Chapter 11, pp. 141-152
		• Chapter 12, pp. 154-163
		• Related topics

2	**X-ray Attenuation**
	
	• Subject Contrast
	• Attenuation, Absorption and Scatter
	• Exponential Attenuation
	      First attenuation equation (linear attenuation coefficient)
	      Half-value layer
	      Second attenuation equation (in terms of the HVL)
	• Heterogeneous X-ray Beams
	• X-ray Beam Filtration
	• Anode Heel Effect
	• Attenuation Mechanisms
	      Compton scatter
	      Photoelectric attenuation
	• Dominant Attenuation Process
	• Attenuation Events and Absorbed Dose
		Bushong:
		• Chapter 13, pp. 164-175
		• Related topics

Chapter in Notes	Topics	Reference /Reading

	• Absorption Edges
	    K-edge filters
	    Intensifying screen phosphors (rare earth elements)
	• Screen Speed
	• Quantum Mottle
	• Measurement of Radiation	