



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

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

Course Outline For:
PHYS 3275
Physics: Medical Radiography III

Instructor: Darlene Starratt

| | | | | | |
|--------------------|---|---------------------|----|--------------------|-----|
| Hours/Week: | 3 | Total Hours: | 24 | Term/Level: | 3 |
| Lecture: | 1 | Total Weeks: | 16 | Credits: | 4.0 |
| Lab: | 2 | | | | |

Prerequisites

PHYS 1275, 2275

Course Record

Developed by: Darlene Starratt Date: January 3, 2001
Instructor

Approved by: *M. Schuppelli* Date: Jan 2001
Program Head of Technology

Course Calendar Description

PHYS 3275 continues the Physics of X-rays covered in PHYS 1275 and PHYS 2275. Lectures cover basic physics of digital concepts in radiography. Topics include counting statistics, digital terminology, binary numbers, data acquisition, computed radiography and digital radiography. Laboratory titles are the Inverse Square Law, Output vs. kV, kV Accuracy, Counting Statistics, and Scatter Distribution.

Course Goals

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.

Evaluation

| | | |
|--------------------|-------|---|
| Laboratory Reports | 50 | % |
| Lab Test | 20 | % |
| Final Examination | 30 | % |
| | <hr/> | |
| | 100 | % |

Evaluation

Students will be evaluated through a combination of tests, assignments, projects, examinations, or other means as specified by the instructor. See Course Specifications for evaluation details. BCIT Policy 5410 "Evaluation of Students" will apply.

Course Learning Outcomes

At the end of this course, 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



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

Course Specifications For:
PHYS 3275
Physics: Medical Radiography III

Instructor: Darlene Starratt

Effective Date

This course outline takes effect January 3, 2001.

Instructor

| | | | |
|------------|------------------|--------|----------|
| Office No: | SW3-4081 | Phone: | 451-7151 |
| E-mail: | dstarrat@bcit.ca | Fax: | 433-2132 |

| | | | | | |
|--------------|----------------|-----------------|-------------------|------------------|----------------|
| Office Hours | Monday open | Tuesday open | Wednesday open | Thursday open | Friday open |
|--------------|----------------|-----------------|-------------------|------------------|----------------|

Text(s) and Equipment

Required:

- Bushong, Stewart C., *Radiologic Science for Technologists: Physics, Biology and Protection*, sixth edition, Mosby, (1997).
- A Manual of Experiments in Medical Radiography Technology

Evaluation Policies

- **Passing Grade:** The passing grade in this course is 60%. The final mark is a weighted average of all tests quizzes and lab work.
- **Lab Test:** will be related to laboratory exercises and concepts covered in the labs.
- **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.

Other Course Policies and Information

- **Attendance:** Students are expected to attend classes regularly in accordance with the current BCIT Calendar attendance policy.
- **Class Conduct:** Students are expected to act professionally during class. Students disrupting classes or disturbing others during class will be asked to leave and their behaviour will be reported to their program head.
- **Course Outline Changes:** The material specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.
- **Ethics:** BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism will be dealt with in accordance with BCIT's Conduct and Attendance Policy in the calendar and, may result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.
- **Illness:** A doctor's note is required for any illness causing you to miss an assignment, quiz, test, or exam. At the discretion of the instructor, you may complete the work missed or have an agrotat mark (i.e. an average is given according to your performance on other tests or assignments).
- **Labs:** Lab attendance is mandatory.
- **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.
- **Physics Learning Centre:** Additional help may be obtained in the Physics Learning Centre, Room SW3-4785, during posted hours.
- **Workload:** The time that you will need to succeed in this course depends on your own background and abilities. It is very important to study regularly, keep up with the work and seek the assistance of the instructor when problems arise. The course load is quite heavy and to succeed you must be prepared to make the appropriate personal time commitment.

I.D. Required in Examination Centres

Effective December 2000, in order to write exams, students will be required to produce photo-identification at examination centres. Photo I.D. must be placed on the desk before an exam will be issued to the student. The I.D. must remain in view on the desk while writing the exam, for inspection by invigilators. Students should bring a BCIT OneCard or alternatively two pieces of identification, one of which must be a government photo I.D. such as a drivers license. Please see BCIT Policy #5300, Formal Invigilation Procedures.



BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

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

Schedule For:
PHYS 3275
Physics: Medical Radiography III

| Chapter | Topics | Reference /Reading |
|---------|--|---|
| 1 | Review <ul style="list-style-type: none"> k-edge, k-edge filters and rare earth elements | Phys 2275 notes |
| 2 | Anode Heat Loading <ul style="list-style-type: none"> Maximum heat load Heat loss; fixed anode and rotating anode Maximum power input curve Anode heating and cooling curves | Phys 2275 notes (Chap. 6) Bushong (Chap. 10) |
| 3 | Counting Statistics <ul style="list-style-type: none"> Poisson distribution Image array (pixels) Normal distribution Counting statistics and quantum noise Quantum Mottle | |
| 4 | Digital Concepts <ul style="list-style-type: none"> Terminology Bits and bytes Binary numbers and number of grey levels Memory organization and size Data acquisition Analog to digital conversion PACS, DICOM, and JPEG | Bushong (Chap. 28) |
| 5 | Computed Radiography <ul style="list-style-type: none"> Photostimulable phosphor plate Latent image Characteristic Curve Resolution Advantages and disadvantages | Bushong (Chap. 28) |
| 6 | Digital Radiography <ul style="list-style-type: none"> Direct to digital Scanned Projection Radiography Amorphous silicon flat panel detector CCD camera | Bushong (Chap. 28) |