Medical Radiography Technology

Radiation Protection

COURSE INFORMATION

COURSE NUMBER	**RADP 215**
TOTAL HOURS	**75**
THEORY	**75**
PRACTICAL	**0**
PREREQUISITES	**None**
CO-REQUISITES	**None**
ACADEMIC UNIT RESPONSIBLE FOR COURSE	**Allied Health Education**

STUDENTS, PLEASE NOTE

This course contains information that may be required to substantiate learning for pr
recognition. It is your responsibility to retain a copy for your own use during your pro
graduation.

COURSE DESCRIPTION

Radiation Protection introduces radiographic policies, regulations and procedures
the as-low-as-reasonably-achievable (ALARA) principle for the protection of self, th
other individuals who may find themselves exposed to medical radiation. Topics w
effects of ionizing radiation on body tissues and the detection and measurement o

COURSE OBJECTIVES

Following completion, the student will be able to:

1. Explain the differences between radiation protection procedure guidelines used in clinical and educational sites.
   1.1. Identify basic radiation procedures that are used for a routine examination.
   1.2. Outline the safety procedures found in a laboratory safety guide.
   1.3. Identify procedures for potentially pregnant students.
   1.4. Describe the scope and principle aims of the various safety codes.
   1.5. Explain the Canadian Association of Medical Radiation Technologists' best practice guidelines for radiation safety.
   1.6. Identify radiation protection policies in various healthcare environments.
   1.7. Outline the role of a technologist in keeping patients, staff, and other people in the imaging department safe from the effects of radiation.
   1.8. Describe emergency situations related to x-ray equipment.

2. Describe the physical properties of an X-ray beam.
   2.1. Compare different sources of radiation.
   2.2. Explain the dual nature of X-ray energy as a particle and as a wave.
   2.3. Differentiate between ionizing and non-ionizing radiation from man-made and natural sources.
   2.4. Compare different units of measurements of radiation.
   2.5. Explain the inverse square law.
   2.6. List the properties of X-rays.

3. Explain the relationship between the X-ray beam and absorbed dose.
   3.1. Describe the radiographic sequence.
   3.2. Describe atomic structure.
   3.3. Describe the process of absorption.
   3.4. Illustrate the X-ray photon interactions with matter that are relevant to diagnostic radiology.
   3.5. Identify important relationships between interactions with matter and technical factor selection.
   3.6. Differentiate between the effects primary and scatter radiation have on radiation safety.

4. Ascertain the radiation risks involved in diagnostic radiology.
   4.1. Identify early radiation injuries and current suspected radiation responses.
   4.2. Discuss various theories and laws that apply to radiation exposure.
   4.3. Identify factors that affect a radiation dose response.
   4.4. Explain factors influencing radiosensitivity.
   4.5. Discuss the effects of in-vitro irradiation of macromolecules and radiolysis of water.
   4.6. Discuss the risks of genetic effects.
   4.7. Characterize local tissue damage.
   4.8. Compare radiation risk estimates and models.

5. Analyze personnel radiation dose.
   5.1. Describe different types of monitoring devices and their specific uses.
   5.2. Describe the benefits and limitations of using radiation monitoring devices.
   5.3. List requirements for proper dose monitoring.

5.4. Respond appropriately to radiation dose reports.

6. Evaluate patient radiation dose.
   6.1. Calculate estimated skin dose to patients based on output and patient technique.
   6.2. Determine relative dose expectations for specific examination.
   6.3. Describe proper documentation related to fetal dose measurements.
   6.4. Discuss the guidelines used for reducing dose to sensitive tissues.

7. Explain the as low as reasonably achievable (ALARA) principle.
   7.1. Describe the benefit versus risk concept.
   7.2. Explain the three cardinal rules of radiation protection.
   7.3. Identify the role of radiation protection agencies.
   7.4. Summarize how the safety code helps personnel achieve their radiation safety objectives.
   7.5. Identify appropriate diagnostic reference levels (DRLs) for a select examination.
   7.6. Outline the importance of exposure indices in a digital environment.

8. Explain safe practices for minimizing radiation dose to patients.
   8.1. Explain the role prime factors play in decreasing patient dose.
   8.2. Discuss the importance of shielding.
   8.3. Describe the effect beam restriction has on decreasing the does to the patient.
   8.4. Outline the effect of filtration on average beam energy.
   8.5. Identify ways to reduce patient exposure through communication with the patient.
   8.6. Describe ways in which positioning can be used to decrease patient dose.
   8.7. Discuss the effects that accessory equipment may have on patient dose.
   8.8. Explain the role that quality control (QC) plays in decreasing the overall number of images taken.

9. Explain best practices for minimizing dose to imaging and support personnel during diagnostic imaging procedures.
   9.1. Explain the concept of effective dose limits and their application.
   9.2. Identify radiation safety roles and responsibilities within a diagnostic imaging department.
   9.3. Compare protective measures for the three types of radiation that may be in a radiographic room.
   9.4. Explain the various methods and devices that will decrease the dose to the technologist and support personnel.
   9.5. Discuss best practices for support personnel in the imaging department.
   9.6. Discuss best practices when performing mobile examination.

10. Educate individuals regarding radiation risks.
    10.1. Describe risks and benefits of radiation with patients and medical and support personnel.
    10.2. Describe the consultation process used with other medical radiation personnel regarding radiation risks.
    10.3. Discuss current radiation safety literature.
    10.4. Describe best practices for communicating radiation safety.
    10.5. Identify limitations of professional responsibilities.

11. Explain radiation safety procedures for the pregnant technologist or patient.
    11.1. Describe gonadal radiation dose.

11.2. State the effects of radiation in utero.
11.3. Examine rules for protecting pregnant patients, radiographers, and other exposed individuals.
11.4. Identify industry standards for patient and physician documentation.
11.5. Outline methods for protecting a pregnant patient from radiation.

12. Explain how building design and radiation protection surveys contribute to providing a safe environment.
12.1. Discuss the design of protective barriers.
12.2. Describe the relationship between building design and radiation protection.
12.3. Summarize the guidelines for imaging machine installation.
12.4. Explain the purpose of radiation protection surveys.
12.5. Determine the safest place to be in a room in relation to the primary beam and scatter.

COMMON STUDENT LEARNING OUTCOMES

Upon successful completion of Anderson College programs, the student will:

Learn
Students will actively and independently acquire, apply, and adapt skills and knowledge to develop expertise and a broader understanding of the world as lifelong learners.

Think
Students will think analytically and creatively to explore ideas, make connections, draw conclusions, and solve problems.

Communicate
Students will exchange ideas and information with clarity and originality in multiple contexts.

Integrate
Students will demonstrate proficiency in the use of technologies in the broadest sense related to their field of study.

Act
Students will act purposefully, reflectively, and respectfully in diverse and complex environments.

EVALUATION

COLLEGE GRADING SYSTEM

The student must achieve an overall minimum grade of 70% on course assessments to be successful.

Students who achieve a failing grade of less than 70% may be eligible to write a supplemental examination to gain course credit. Remedial assistance will be required prior to writing the supplemental examination. Students will not progress in the program without achieving a passing grade in the course.

COURSE EVALUATION

Quizzes (2)	40%
Assignment	30%
Exam	30%
Total	**100%**

ASSESSMENT RATIONALE/ CRITERIA

Achievement of learning outcomes will be assessed through class participation, class work, group activity, assignment, tests, project, mid-semester examination, and end of semester examination. Assessment will require students to demonstrate understanding and application of all the topics taught.

LEARNING MATERIALS

REQUIRED TEXTS

Lavie, C. & Martel, N. (Eds). (2008). **Safety Code 35**: Safety Procedures for the Installation, Use and Control of x-Ray Equipment in Large Medical Radiological Facilities (HC Publication: 4000). Retrieved from: http://www.hc-sc.gc.ca/ewhsemt/pubs/radiation/safety-code_35-securite/index-eng.php

Statkiewicz, S., Visconti, M. A. & Ritenour, E. R. (Last Published). Radiation Protection in Medical Radiography (Current ed.). St. Louis, MO: Mosby Elsevier.

Bushong, S. C. Radiologic Science for Technologists: Physics, Biology, and Protection (Current ed.). St. Louis, MO: Mosby Elsevier.

SUGGESTED READINGS

To be determined by the instructor.

REFERENCE TEXTS AND MATERIALS

To be determined by the instructor.

TEACHING/LEARNING STRATEGIES

Lectures on all the topics, power point presentations, video presentations, classwork, assignments, groupwork. All the students are expected to familiarise themselves with foundational knowledge prior to class. Personal study before and after classes and use of online resources are essential.

COLLEGE POLICY STATEMENTS

Refer to the [redacted] College Student Handbook for more information on the following policies.

ACADEMIC RESPONSIBILITY – STUDENTS

1. Each student must know the due dates for assignments, tests, and examinations.
2. Each student must maintain their own academic record of work covered each Unit/term.
3. Each student must maintain paper and electronic copies of assignments for the academic year.
4. Each student must arrange academic discussion time with a faculty member to discuss progress.
5. Each student must perform self-evaluation on progress in the course.

PERSONAL CONDUCT – STUDENTS

1. Students must arrive on time for class and be prepared to work when the instructor begins.
2. Students must be courteous to faculty and classmates.
3. Eating in classrooms and clinic is not allowed.
4. Cell phones, Text messengers and other electronic devices must be turned off during class time.

ACADEMIC ADVANCEMENT

At mid-point and at the end of each academic term, the members of the Faculty Team (FT) for the Medical Radiography Technology program meet to review the progress of all students. Following these meetings each student is advised orally and in writing of their status in the program.

Students experiencing difficulty will be counseled regarding assistance available to foster academic success.

At the end of each term, the Medical Radiography Technology Program Instructor and or Director of Education will make recommendations after deliberating on all relevant information. Decisions regarding each student may include (but are not limited to) the following. S/he has:

- Successfully completed all program requirements and can graduate.
- Successfully completed all requirements and is promoted to the next academic level in the program.
- Been granted supplemental privileges for courses not successfully completed and if successful will graduate or be promoted to the next academic level. **Supplemental privileges are not automatically granted and will be limited in number.**
- Not successfully completed all elements in the academic level but may remain in the program to repeat failed portions and continue toward program completion according to an individualized timetable.
- Experienced such difficulty that repetition of the entire academic level is required, and a space will be provided for the student in the program at the earliest opportunity if the student wants to return.

- Experienced such difficulty that the student is asked to leave the school and if s/he desires readmission must complete the admissions process in competition with other applicants.

ATTENDANCE

Attendance is mandatory – The College reserves the right to determine whether absences are excused or unexcused (may affect student funding) and to request any medical evidence that may be required. Student tardiness is unacceptable, and students are expected to demonstrate professional behaviour at all times, in class or on a clinical placement. Students are entirely responsible for catching up on their own or for missed material and demonstrations. A doctor's note may be requested for each absence.

Absence from Missed Test/Assignment Due Protocol

Upon return to school, the student is to provide a doctor's note or approved excusable absence to the instructor prior to admission to the make-up test/submission of late assignments. Failure to submit an approved excuse within 5 school Units upon return, the student will receive a zero for all missed, tests and late assignments.

Absence from Class Protocol

The College monitors attendance closely. A student who is absent from a class more than 3 times in a term, will be identified at risk and required to submit a doctor's note or approved excusable absence to their instructor(s) and the Program Instructor prior to readmission to the class.

Make-Up Procedure

All students are expected to take exams at the scheduled time. Make-up exams will be arranged only in recognized emergency cases. The instructor must be informed before or during the exam, to be eligible. Refer to the Anderson College Student Handbook for protocols. Quizzes are taken in class and at the time specified by the instructor. Late students will be given no extra time for the quiz. Quizzes given in the classroom cannot be made-up.

CHEATING AND PLAGIARISM

Any evidence of cheating will result in a failure for the course. Evidence of plagiarism will result in a failure for all students involved in the plagiarism. Plagiarism is turning in the work of someone else as if it was your own. When working on assignments in a group setting, students must submit their assignments using their own words. Identically worded assignments submitted by multiple students are acts of plagiarism.

MOBILE PHONES

Mobile phones are to be turned completely OFF while class is in session. Please use laptop computers responsibly. Web browsing, messaging, emailing, and recording are otherwise prohibited during class. Students who abuse the privilege of using their laptops will be asked to put it away for the duration of the class.