Medical Radiography Technology

Computed Tomography Theory 1

COURSE INFORMATION

COURSE NUMBER	**MRAD 251**
TOTAL HOURS	**75**
THEORY	**75**
PRACTICAL	**0**
PREREQUISITES	**ANPH 202 - Anatomy and Pathology 1** **APPH 226 - Apparatus and Image Management** **MEDT 211 - Medical Terminology** **MRAD 204 - Radiologic Technique 1** **MRAD 223 - Patient Care 1** **RADP 215 - Radiation Protection** **PRCT 250 - Introduction to Clinical Placement**
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 professional recognition. It is your responsibility to retain a copy for your own use during your program and after graduation.

COURSE DESCRIPTION

Computed Tomography Theory 1 provides learners with an overview of computed tomography (CT), basic principles of CT, equipment, image acquisition, reconstruction, and quality control. Emphasis will be placed on safety, patient care, assessment, and contrast administration.

COURSE OBJECTIVES

Following completion, the student will be able to:

1. Explain the basic principles of computed tomography (CT) physics and fundamentals.

    1.1 Explain the process of X-ray production in an X-ray tube.

    1.2 Outline the basic steps for acquiring a CT image.

    1.3 Outline the process for data acquisition, image reconstruction, image display and image archive in CT.

    1.4 Differentiate planar imaging from tomographic imaging.

2. Analyze computed tomography (CT) system design and components.

    2.1 Apply terminology specific to CT equipment.

    2.2 Characterize the various acquisition components that comprise a CT scanner.

    2.3 Outline the differences among the various generations of CT scanners.

    2.4 Describe the applications of CT fluoroscopy, dual source CT, CT simulation, CT screening, and CT in nuclear medicine.

    2.5 Explain the components and operation of contrast medium injection devices.

3. Analyze components of image formation and appearances.

    3.1 Apply terminology specific to computed tomography (CT).

    3.2 Summarize the parameters that operators have at their disposal when manipulating image appearance.

    3.3 Summarize the use of windowing in CT image display.

    3.4 Describe CT image post-processing tools.

    3.5 Describe the different types of image reconstruction used in CT.

    3.6 Explain the concepts of maximum intensity projection (MIP), multiplanar reconstruction (MPR), and three-dimensional (3D) imaging.

    3.7 Identify common CT image artifacts.

4. Identify quality control requirements and quality assurance data for computed tomography (CT).

4.1 Distinguish between the principles of quality control and quality assurance.

4.2 Describe the principles of quality control.

4.3 Describe data collected for quality assurance.

4.4 Identify different types of quality control tests.

4.5 Explain the purpose of quality control tests.

5. Summarize radiation safety in computed tomography (CT).

5.1 Describe basic CT radiation protection procedures.

5.2 Describe factors affecting patient dose.

5.3 Explain the use of dosimetry in CT.

5.4 Outline radiation protection considerations specific to CT.

5.5 Outline dose modulation used in CT imaging.

5.6 Distinguish radiation effects to organs and their tissues.

5.7 Outline best practices for radiation safety.

6. Summarize considerations for patient care related to computed tomography (CT).

6.1 Describe the role and responsibilities of a technologist related to patient screening for CT scans.

6.2 Identify important elements of a patient requisition and consent form.

6.3 List the lab work and medications that need to be considered prior to scanning.

6.4 Describe patient education in regard to administering contrast media.

6.5 Describe how to effectively counsel a patient with respect to post-procedural care.

7. Summarize the use of contrast media and intravenous injections in computed tomography (CT).

7.1 Compare the different types of contrast media available.

7.2 Describe indications and contraindications for the use of contrast media.

7.3 Identify the types of adverse reactions to contrast media.

7.4 Describe the management of adverse reactions to contrast media.

7.5 Outline the factors that determine the route of the contrast media and equipment selection.

7.6 Identify proper sterile techniques when performing intravenous injections.

COMMON STUDENT LEARNING OUTCOMES

Upon successful completion of Edenbrook 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

Quiz	20%
Assignment (2)	45%
Final Exam	35%
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

Romans, L. (Last Published). Computed Tomography for Technologists: A Comprehensive Text (Current ed.). Baltimore, MD: Lippincott, Williams & Wilkins.

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 Edenbrook 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 Edenbrook 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.