

RADI 6031
Physics Measurements in Radiotherapy I

Fall 2019

CLASS DAYS and TIME: Friday 2PM-5PM

CLASSROOM: CTRC Building - Grossman Plaza (G254)

COURSE FACULTY: Director: Neil Kirby, PhD, Co-Director: Pamela Myers, PhD

OFFICE LOCATION and HOURS: By Appt. Office: G240

EMAIL: kirbyn@uthscsa.edu

TELEPHONE: 210-450-5674

READ THIS DOCUMENT CAREFULLY - YOU ARE RESPONSIBLE FOR ITS CONTENTS.

COURSE DESCRIPTION AND OBJECTIVES

The goal of the course is to teach students the guidelines established by the American Association of Physicists in Medicine (AAPM).

Pre-requisites – None

Semester credit hours – 3

By the end of this course, each student should be able to:

- **Understand the advanced principles of standard radiation therapy**
- **Understand the importance and application of safety in radiation therapy**
- **Understand the application of specialized radiologic treatment modalities**

COURSE ORGANIZATION

The main teaching modalities used in this course include:

- 1) **Conventional didactic lectures**
- 2) **Classroom discussion**
- 3) **Supplement reading material**

Materials – See below

Computer Access – Many of the presentations are given in the common lecture format and are accompanied by Pdf converted PowerPoint slide files. You are responsible for all information included in the lecture materials. However, you should not assume that all testable lecture material is found only in the posted materials. That is, lectures may be expanded and enhanced during in-class presentations. So, take good notes because any information discussed in class is considered testable.

Reading Assignments – Required reading assignments are posted in the schedule of class meetings (shown below) and are never considered optional. Unless specifically noted by the instructor, anything in the required readings, whether emphasized in class or not, is considered testable on exams. Mandatory readings are primarily found in the required text book (see below). However, occasionally a reading assignment will be given that is posted online or sent to you via email attachment. Most reading assignments are located at: <P:\Share\Course Materials\6035>

ATTENDANCE

In order to achieve the expected level of competency, students must be fully engaged. Therefore, attendance for every class session is expected. It is recognized that a student may occasionally arrive late to class due to unexpected traffic problems or inclement weather. However, chronic lateness is considered an unprofessional behavior that disrupts the learning environment for everyone else in the classroom.

TEXTBOOKS

Required: Materials will be provided in pdf form.

GRADING POLICIES AND EXAMINATION PROCEDURES

Testable material comes from 2 main sources: quizzes and the final examination. Final letter grades will be based on the following: The quizzes will account for 65% of the grade and the final exam will account for the remaining 35%.

Presentation Requirements:

The following deliverables are required for the individuals presenting (due the day before the presentation)

- Presentation
- 1 page summary
- Quiz questions (10 MC)

Final Exam:

For the final exam, a mock ABR-style oral exam will be given. The final exam will be 20 minutes in length. The exam is designed to test your knowledge and fitness of medical physics as it applies to the Task Group Reports presented in this course. Questions will be asked from the 5 physics categories used for ABR oral examination.

The exam categories are:

Radiation Protection and Patient Safety

Time, distance and shielding; workload, use and occupancy factors; shielding design for primary, scattered and leakage radiation; barrier calculation; report preparation; air concentrations of radioactivity; department design; radiation standards and units; radiation protection principles; radiation regulations and requirements; responsibilities of the radiation protection office; radiation surveys in diagnostic radiology, nuclear medicine and radiation therapy; characteristics of survey equipment; evaluation of radiation hazards; personnel monitoring; and related subjects.

Patient-Related Measurements

Calculation of dose from photon and particle beams and radionuclide sources; radiotherapy treatment planning; physical factors affecting dose (e.g., beam intensity,, field size, depth, thickness, filtration, half-life, screens, grids, concentration, etc.); special techniques and devices (e.g., rotational therapy, stereotactic radiosurgery; IMRT; wedge filters, infusion techniques, grids, tomography, computed tomography, ultrasound, computers and their applications, etc.); preparation of applicators; LDR and HDR brachytherapy; in vivo and in-phantom dose measurements; and related subjects

Image Acquisition, Processing and Display

Principles of and techniques for image acquisition; image formation; digital imaging; computer-based image reconstruction; methods for image display; image analysis; image processing, image enhancement, fusion and segmentation; image artifacts; modulation transfer function; signal to noise ratio; and related subjects.

Calibration, Quality Control and Quality Assurance

Characteristics and use of calibration equipment; measurements of radiation quantity and quality; calibration and evaluation of ionizing and nonionizing radiation sources and installations; calibration and evaluation of measuring, recording and imaging devices; acceptance testing, commissioning, quality control and quality assurance; and related subjects.

Equipment

Principles and properties of radiation generating equipment; radiation sources; radiation receptors; radiation therapy equipment; diagnostic radiological equipment; nuclear medicine equipment; ultrasound equipment; nuclear magnetic resonance equipment; and related subjects

Late Arrival to Exams: Exams will be timed. If you arrive late to an exam, and are given permission to take the exam, you will not be given additional time to complete your test. If you arrive after another student has finished the exam

and has departed the exam room, you will not be allowed to take the exam. If you miss an exam, you may be eligible for taking a make-up exam.

Make-up Examinations: A student who must miss a scheduled exam for a serious reason must request an excused absence from the Course Director. Acceptable “serious reasons” usually involve serious illness or injury to the student (doctor’s excuse may be required) or the student’s family member. Examples of unacceptable reasons include: Not prepared or incomplete studying, over-sleeping, hangover, heavy traffic or any travel delays, other appointments or scheduled professional or personal commitments.

If it is determined that missing an exam is justified, a make-up examination will be scheduled. The make-up exam will be given as soon as possible at a time designated by the Course Director. Any student who misses an exam and does not receive an excused absence **will receive a grade of zero for that exam.**

Grading System

Include a grading scale used to determine final grades, see example below

A = 90-100% B = 80-89% C = 70-79% F = < 69%

REQUESTS FOR ACCOMODATIONS FOR DISABILITIES

In accordance with policy 4.2.3, **Request for Accommodation Under the ADA and the ADA Amendments Act of 2008 (ADAAA)**, any student requesting accommodation must submit the appropriate request for accommodation under the American with Disabilities Act (ADA, form 100). to his/her appropriate Associate Dean of their School and a copy to the ADA Coordinator. Additional information may be obtained at <http://uthscsa.edu/eeo/request.asp>.

ACADEMIC INTEGRITY AND PROFESSIONALISM

Any student who commits an act of academic dishonesty is subject to discipline as prescribed by the UT System Rules and Regulations of the Board of Regents. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an exam for another person, signing attendance sheets for another student, and any act designed to give unfair advantage to a student or the attempt to commit such an act. Additional information may be obtained at <http://catalog.uthscsa.edu/generalinformation/generalacademicpolicies/academicdishonestypolicy/>

TITLE IX AT UTHSCSA

Title IX Defined:

Title of the Education Amendments of 1972 is a federal law that prohibits sex discrimination in education. It reads “no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.”

University of Texas Health Science Center San Antonio’s Commitment:

University of Texas Health Science Center San Antonio (UTHSCSA) is committed to maintaining a learning environment that is free from discriminatory conduct based on gender. As required by Title IX, UTHSCSA does not discriminate on the basis of sex in its education programs and activities, and it encourages any student, faculty, or staff member who thinks that he or she has been subjected to sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to immediately report the incident to the Title IX Director.

In an emergency, victims of sexual abuse should call 911. For non-emergencies, they may contact UPD at 210-567-2800. Additional information may be obtained at <http://students.uthscsa.edu/titleix/>

EMAIL POLICY

Every student is issued a University e-mail address and account at the time of enrollment. As a matter of University

Policy, communications between students and faculty that occur using the student's University e-mail address is considered official business. Therefore, students are expected to check their university email inboxes on a regular basis so that any announcements, instructions, or information regarding this course will be received in a timely way. Missed communications due to inadequate monitoring of incoming emails on the University's email server will never be a valid excuse for unsatisfactory academic progress.

USE OF RECORDING DEVICES

Recording of lectures and other learning activities in this course by any means (*e.g.*, video, audio, etc.) is only permitted if approved by the instructor or required for compliance with Americans with Disabilities Act (ADA).

ELECTRONIC DEVICES

Cell phones must be turned off during all class meetings and exams. Computers and electronic tablets are allowed only for participating in classroom activities (*e.g.*, viewing slides presented in lecture or conference materials). No texting, tweeting, emailing, web-surfing, gaming, or any use of electronic devices that is not directly connected with classroom activities is permitted.

**TENTATIVE CLASS SCHEDULE
RADI 6031**

| WEEK | Presenter | TOPIC |
|-------------|------------------|--|
| 8/30 | | Intro and presentation distributions |
| 9/6 | | TG-51 - Protocol for Clinical Dosimetry of High-Energy Photon and Electron Beams |
| | | TG-39 - The Calibration and Use of Plane-Parallel Ionization Chambers for Dosimetry of Electron Beams |
| 9/13 | | TG-71 - Monitor unit calculations for external photon and electron beams |
| | | TG-40 - Comprehensive QA for Radiation Oncology |
| 9/20 | | TG-142 - Quality assurance of medical accelerators |
| | | TG-106 - Accelerator beam data commissioning equipment and procedures |
| 9/27 | | TG-137 - AAPM recommendations on dose prescription and reporting methods for permanent interstitial brachytherapy for prostate cancer |
| | | Dose Calculation for Photon-Emitting Brachytherapy Sources with Average Energy Higher than 50 keV (RPT229) |
| 10/4 | | Report of the Task Group 186 on model-based dose calculation methods in brachytherapy beyond the TG-43 formalism: Current status and recommendations for clinical implementation |
| | | TG-53 - Quality Assurance for Clinical Radiotherapy Treatment Planning |
| 10/11 | | TG-50 - Basic Applications of Multileaf Collimators |
| | | TG-62 - Diode in Vivo Dosimetry for Patients Receiving External Beam Radiation Therapy |
| 10/18 | | TG 147 - Quality assurance for nonradiographic radiotherapy localization and positioning systems |
| | | TG-58 - Clinical Use of Electronic Portal Imaging |
| 10/25 | | TG-119 - IMRT commissioning: Multiple institution planning and dosimetry comparisons |
| | | TG-201 - Information technology resource management in radiation oncology |
| 11/1 | | TG-159 - Recommended ethics curriculum for medical physics graduate and residency program |

| | | |
|-------|--|--|
| | | Rpt-98 - Report of the AAPM Low Energy Brachytherapy Source Calibration Working Group: Third-party brachytherapy source calibrations and physicist responsibilities |
| 11/8 | | TG-154 - Quality assurance of U.S.-guided external beam radiotherapy for prostate cancer |
| | | TG-105 - Issues associated with clinical implementation of Monte Carlo-based photon and electron external beam treatment planning |
| 11/15 | | TG 176 - Dosimetric effects caused by couch tops and immobilization devices |
| | | Radiation Safety Officer Qualifications for Medical Facilities |
| 11/22 | | ICRU 83 Prescribing, Recording, and Reporting Photon-Beam Intensity-Modulated Radiation Therapy |
| | | ICRU 76 Measurement Quality Assurance for Ionizing Radiation Dosimetry |
| 12/6 | | Lab on TG142 Mechanical QA for Linac / TG51 |
| 12/13 | | Final Exam |