

RADI 6033
Physics of Radiotherapy II
Spring 2020

CLASS DAYS and TIME: Monday and Wednesday (9:45 – 11:15)

CLASSROOM: Grossman Mini Plaza

COURSE DIRECTOR: Daniel Saenz, Ph.D.

COURSE LECTURERS: Shabbou Ghahremani, DMP, Neil Kirby, Ph.D., Karl Rasmussen Ph.D., Pamela Myers Ph.D., Daniel Saenz Ph.D., Thomas Martin, Ph.D.

OFFICE LOCATION and HOURS: Open office hours: G236

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

COURSE DESCRIPTION AND OBJECTIVES

Theory, design, and operation of radiation producing equipment used in radiation therapy. Exposure and absorbed dose calculations, patient dosimetry, treatment planning, and use of computers in radiation therapy.

Pre-requisites – RADI 6030

Semester credit hours – 3

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

- Demonstrate that they understand how x-rays are generated and how radiation producing machines are used in the clinic.
- Demonstrate that they understand the physical and mathematical principles of the different radiation interactions as well as their clinical significance.
- Demonstrate that they understand how dose distributions are generated and how scatter analysis is performed.
- Demonstrate that they understand how to perform dosimetry calculations related to treatment planning using various techniques.
- Demonstrate that they understand the fundamentals of modern-day radiation therapy treatment techniques and associated equipment.
- Demonstrate that they understand how special procedures are performed in a clinical environment and the physics implications that go along with them.

COURSE ORGANIZATION

The course is designed as an advanced application to radiation therapy fundamentals and covers the second half of the primary reference which is the book by Faiz Khan on “The Physics of Radiation Therapy”, along with supplemental lectures as deemed necessary. Lectures will be given in the form of slide presentations, together with discussion using the white board in the classroom. There is a list of reading materials and references that the students are responsible to read. A quiz will be given at the end of each unit. All materials will be available on CANVAS, including the quizzes. The students will need to have a laptop or tablet device to take the quizzes in the classroom

Materials – See below under the Textbooks section

Computer Access – 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 textbook (see below). However, occasionally a reading assignment will be given that is posted online or sent to you via email attachment.

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:

- The Physics of Radiation Therapy, 4th Edition, Faiz M. Khan; Lippincott, Williams & Wilkins, 2009
- Brachytherapy Physics, Second Edition. Authors: Bruce Thomadsen, Mark Rivard and Wayne Butler, eds. ISBN: 1-930524-24-2 Published: 2005 | 982 pp. | Hardcover
- Shielding Techniques for Radiation Oncology Facilities, Second Edition Authors: Patton H. McGinley ISBN: 1-930524-07-2 Published: 2002 | 184 pp.

Recommended References:

- SRS/IMRT Summer school on IMRT, VanDyk,
- E Podgorsak IAEA book on physics of radiation therapy
- Med. Phys. 10(6), 741-765, 1983, TG-21, "A Protocol for Absorbed Dose from High Energy Beams"
- Med. Phys. 18(1), 73-109, 1991, TG-25, "Clinical Electron Beam Dosimetry"
- Attix, Introduction to Radiological Physics and Radiation Dosimetry, John Wiley and Sons, 1986
- Hendee, William R. & Geoffrey S. Ibbott, Radiation Therapy Physics, 2nd Edition, Mosby, St. Louis, MO, 1996
- ICRU Report 50, Prescribing, Recording, and Reporting Photon Beam Therapy, International Commission on Radiation Units and Measurements, Bethesda, MD, 1993.
- NCRP Report #49, Structural Shielding Design and Evaluation for Medical Use of X-rays and Gamma rays of Energies up to 10MeV, National Council on Radiation Protection and Measurements, Washington D.C., 1976
- NCRP Report #51, Radiation Protection Design Guidelines for 0.1-100MeV Particle Accelerator Facilities, National Council on Radiation Protection and Measurements, Washington D.C., 1977
- Kahn, F., Treatment Planning in Radiation Oncology, Williams & Wilkins, 1998

GRADING POLICIES AND EXAMINATION PROCEDURES

Testable material comes from 3 main sources: Lecture presentation, reading assignments and in class discussion. Final letter grades will be based on the multiple choice type quizzes that will be scheduled throughout the semester. Each quiz will be equally weighted. There will be 3 quizzes during the semester (20% of your grade will come from each). Participation in the course will be 10%. The final exam will count for 30% of your grade.

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 miss an exam for an excused reason, you may be eligible to

schedule 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, 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

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

REQUESTS FOR ACCOMMODATIONS 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 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).

C#	Date	Lecture Topic	Required Reading	Instructor
0	Monday, January 6, 2020	Official start of semester		
1	Wednesday, January 8, 2020	Introduction to course and expectations	Ch. 16 - Khan	Shabbou Ghahremani, DMP
2	Monday, January 13, 2020	Introduction to Radiation Protection	Ch. 16 - Khan	Shabbou Ghahremani, DMP
3	Wednesday, January 15, 2020	TBI	Ch. 18 - Khan	Thomas Martin, PhD
4	Monday, January 20, 2020	TSE	TG -23	Thomas Martin, PhD
5	Wednesday, January 22, 2020	University Holiday		
6	Monday, January 27, 2020	Shielding Design and Vault construction	Shielding Techniques for Radiation Oncology Facilities by McGinley	Daniel Saenz, Ph.D.
7	Wednesday, January 29, 2020	Shielding Design and Vault construction	Shielding Techniques for Radiation Oncology Facilities by McGinley	Daniel Saenz, Ph.D.
8	Monday, February 3, 2020	Shielding Design and Vault construction	Shielding Techniques for Radiation Oncology Facilities by McGinley	Daniel Saenz, Ph.D.
9	Wednesday, February 5, 2020	Quiz 1		Daniel Saenz, Ph.D.
10	Monday, February 10, 2020	Three-Dimensional Conformal Radiation Therapy	Ch. 19 - Khan	Daniel Saenz, Ph.D.
11	Wednesday, February 12, 2020	Intensity-Modulated Radiation Therapy	Ch. 20 - Khan	Shabbou Ghahremani, DMP
12	Monday, February 17, 2020	IMRT Demo Plan	Ch. 20 - Khan	Daniel Saenz, Ph.D.
13	Wednesday, February 19, 2020	University Holiday-President's Day		
14	Monday, February 24, 2020	Stereotactic Radiotherapy and Radiosurgery	Ch. 21 - Khan	Pamela Myers, PhD
15	Wednesday, February 26, 2020	Stereotactic Radiotherapy and Radiosurgery	Ch. 21 - Khan	Pamela Myers, PhD
16	Monday, March 2, 2020	Stereotactic Body Radiation Therapy	Ch. 22 - Khan	Pamela Myers, PhD

17	Wednesday, March 4, 2020	Treatment Planning Algorithms QUIZ 2		Niko Papanikolaou, PhD
18	Monday, March 9, 2020	University Holiday- Spring Break		
19	Wednesday, March 11, 2020	University Holiday- Spring Break		
20	Monday, March 16, 2020	Special Stereotactic Machines: Cyberknife and Gammaknife		Neil Kirby, Ph.D.
21	Wednesday, March 18, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
22	Monday, March 23, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
23	Wednesday, March 25, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
24	Monday, March 30, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
25	Wednesday, April 1, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
26	Monday, April 6, 2020	Brachytherapy: History , LDR, HDR and Implant Therapy	Ch. 15 , Ch.23-24	Karl Rasmussen Ph.D.
27	Wednesday, April 8, 2020	Intraoperative RT and Eye Plaques: Technique, Dosimetry, and Treatment Planning	TG -129	Daniel Saenz, Ph.D.
28	Monday, April 13, 2020	Intravascular Brachytherapy	Ch. 25 - Khan	Neil Kirby, Ph.D.
29	Wednesday, April 15, 2020	Image-Guided Radiation Therapy, QUIZ 3	Ch. 26 - Khan	Thomas Martin, PhD
30	Monday, April 20, 2020	Image-Guided Radiation Therapy	Ch. 26 - Khan	Thomas Martin, PhD
31	Wednesday, April 22, 2020	Image Registration and Image Deformation		Neil Kirby, Ph.D.
32	Monday, April 27, 2020	Deformable Image Registration QA		Neil Kirby, Ph.D.
33	Wednesday, April 29, 2020	Deformable Image Registration QA		Neil Kirby, Ph.D.

34	Monday, May 4, 2020	Quality Assurance	Ch. 17 - Khan	Shabbou Ghahremani, DMP
35	Wednesday, May 6, 2020	Quality Assurance Lab - Demonstration at Vault		Daniel Saenz, Ph.D.
36	Monday, May 11, 2020	Proton Beam Therapy	Ch. 26 - Khan	Daniel Saenz, Ph.D.
37	Wednesday, May 13, 2020	Final Exam		