



College of Medicine
Medical Sciences
Medical Physics Graduate Program

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Spring 2024

Therapeutic Radiological Physics I

BME 6591 | Section 21D9 | 3.0 Credit

Instructors:	Dr. Luke Maloney luke.maloney@ufl.edu 352-265-7848 Dr. Amanda Schwarz amanda.schwarz@shands.ufl.edu 352-265-7855	Time:	Monday 2:00-3:55 PM Wednesday 2:00-2:50 PM
Teaching Assistant:	Bryan Bates batesb@ufl.edu	Room:	Communicore Room C2-33

Course description: This is a graduate-level, introductory course in basic therapeutic radiation physics. Topics discussed will include the basic working principles of clinical radiation generators, principles and methods for measurement of ionizing radiation, conventional and historical methods for dosimetric calculations, treatment planning for radiation therapy, and specific topics relevant to the modern practice of radiation therapy.

Course Objectives:

1. Students will learn fundamental knowledge of radiation producing machines used for therapeutic purposes.
2. Students will develop a thorough knowledge of the equipment necessary to measure and calibrate radiation producing machines, mainly linear accelerators.
3. Students will learn the basis of isodose distributions and treatment plan evaluations, patient data acquisition, treatment simulation and verification, and accurately correcting for surface irregularities and inhomogeneities.

Office hours: Scheduled by appointment via email.

Prerequisites/Co-requisites: Radiological Physics, Measurements and Dosimetry (BME 6535), or permission of the instructor(s).

Required textbooks and software:

Required:

1. Khan, F. M. and Gibbons, J. P., *Khan's The Physics of Radiation Therapy*, Fifth edition. Philadelphia, PA: LWW, Apr. 2014, ISBN: 9781451182453

Recommended:

1. Attix, F. H., *Introduction to Radiological Physics and Radiation Dosimetry*, 1st edition. New York: Wiley-VCH, Jan. 1991, ISBN: 9780471011460
2. MATLAB, Python, Microsoft Excel

Recommended materials: Handouts will be distributed as necessary by the instructor(s). These may include reports of task groups of the American Association of Physicists in Medicine (AAPM) (www.aapm.org). Students are encouraged to join AAPM as student members for access to reports and other services, particularly if pursuing a career in medical physics.

Material and supply fees: No additional fees.

Course schedule: The course schedule (see page 6) is tentative and subject to change. Labs will be scheduled as clinic hours allow.

Attendance, class expectations, and make-up work: Attendance of lectures is mandatory, both for students attending in-person and virtually. Penalties for unexcused absences will be assessed at the discretion of the instructor(s), up to a 2% deduction in cumulative average for each. Please make arrangements for excused absences in advance. For an absence to be excused, it must be consistent with university policies in the Graduate Student Handbook (<http://graduateschool.ufl.edu/>), and appropriate documentation must be provided.

Students will regularly be assigned mandatory reading as part of class preparation - it is expected that readings are completed prior to the session in which they will be discussed. Assigned homework and projects must be completed – graded homework is due no later than 5:00 PM on the date it is due. Extensions may be given at the discretion of the instructor(s) for excused absences. Any in-class assignment missed due to an unexcused absence will be assessed a grade of zero.

Evaluation and grading policy: Assigned work will be assessed by the instructor(s) and/or the teaching assistant(s).

- Homework: At the end of each topic, students will be evaluated on their knowledge by completing a 4-5 short answer problem set.

- Quizzes: Once a week for the duration of the semester, students will be asked 3-5 multiple choice questions at the start of class to test their knowledge from the previous lecture.
- Midterm exam I: Midterm exam I will focus on topics taught from lectures 1-7: review topics, clinical radiation generators, interactions of ionizing radiation, and measurement of ionizing radiation. The exam will consist of 20 multiple choice and 5 extended response questions.
- Midterm exam II: Midterm exam II will focus on topics taught from lectures 8-17: quality of x-ray beams, measurement of absorbed dose, dose distribution and scatter analysis, and dosimetric calculations. The exam will consist of 20 multiple choice and 5 extended response questions.
- Final exam: The final exam will be a cumulative exam with extensive focus on lectures 16-25: dose distribution and scatter analysis, a system of dosimetric calculations, isodose distributions, patient data, corrections, and setup, and field shaping, skin dose, and field separation. The exam will consist of 25 multiple choice and 5 extensive response questions.

Final grades will be determined based on weighting indicated in the table below.

assignment	total points	% of final grade
homework and lab reports	100	15
quizzes	100	5
midterm exam I	100	25
midterm exam II	100	25
final exam	100	30

Letter grades will be assigned according to the following scale:

grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
threshold %	93	90	87	83	80	77	73	70	67	63	60	0

More information on the UF grading policy is available in the Graduate Student Handbook (<http://graduateschool.ufl.edu/>).

Students requiring accommodations: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565; <https://disability.ufl.edu>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor(s) when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Student well-being and campus resources: Your well-being is important to your instructors and to the University of Florida. Health and wellness resources available to students include:

- *U Matter, We Care:* If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website (<https://umatter.ufl.edu/>) to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center:* Visit the Counseling and Wellness Center website (<https://counseling.ufl.edu/>) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website (<https://shcc.ufl.edu/>).
- *University Police Department:* Visit the UF Police Department website (<https://police.ufl.edu/>) or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608. The UF Health Emergency Room and Trauma Center website is: <https://ufhealth.org/uf-health-shands-emergency-room-trauma-center>.

Academic resources available to students include:

- *E-learning technical support:* Contact the UF Computing Help Desk (<https://helpdesk.ufl.edu/>) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- *Library Support:* Various ways to receive assistance with respect to using the libraries or finding resources (<https://uflib.ufl.edu/find/ask/>).
- *CLAS Academic Resources:* 1317 Turlington Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring (<https://academicresources.clas.ufl.edu/>).
- *Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers (<https://writing.ufl.edu/writing-studio/>).

- Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information: <https://sccr.dso.ufl.edu/policies/student-honor-%20code-student-conduct-code/>.
- On-Line Students Complaints: View the Distance Learning Student Complaint Process: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>.

Academic conduct: Integrity, honesty, and respect are essential to any academic exercise. UF students are bound by the Student Honor Code and the Student Conduct Code via university regulation. The Honor Code (available at <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies unacceptable behaviors in the course setting and possible sanctions. You are obligated to report any condition which facilitates academic misconduct to the appropriate personnel. If you have any questions or concerns, please consult with the instructor(s) or teaching assistant(s).

Student privacy: There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see <https://registrar.ufl.edu/ferpa/>.

In-class recording: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

Publication without permission of the instructor is prohibited. To publish means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Course schedule 1/08/23 - 03/04/23

lecture	weekday	date	topic		instructor
1	M	01/08/23	introduction and review	Khan Ch. 1-3	Maloney/ Schwarz
2	W	01/10/23	clinical radiation generators	Khan Ch. 4	Maloney
	M	01/15/23	no class (MLK, Jr. Day)		
3	W	01/17/23	clinical radiation generators		Maloney
4	M	01/22/23	interactions of ionizing radiation	Khan Ch. 5	Maloney
5	W	01/24/23	interactions of ionizing radiation		Maloney
6	M	01/29/23	measurement of ionizing radiation	Khan Ch. 6	Maloney
7	W	01/31/23	measurement of ionizing radiation		Maloney
	M	02/05/23	midterm I (material from lectures 1-7)		
8	W	02/07/23	quality of x-ray beams	Khan Ch. 7	Maloney
9	M	02/12/23	quality of x-ray beams		Maloney
10	W	02/14/23	measurement of absorbed dose	Khan Ch. 8	Maloney
11	M	02/19/23	measurement of absorbed dose		Maloney
12	W	02/21/23	measurement of absorbed dose		Maloney
13	M	02/26/23	dose distribution and scatter analysis	Khan Ch. 9	Maloney*
14	W	02/28/23	dose distribution and scatter analysis		Maloney*
15	M	03/04/23	a system of dosimetric calculations	Khan Ch. 10	Schwarz

Course schedule 03/05/23 - 04/24/23

lecture	weekday	date	topic		instructor
16	W	03/06/23	a system of dosimetric calculations	Khan Ch. 10	Schwarz
	M	03/11/23	no class (Spring Break)		
	W	03/13/23	no class (Spring Break)		
17	M	03/18/23	a system of dosimetric calculations		Schwarz
18	W	03/20/23	isodose distributions	Khan Ch. 11	Schwarz
	M	03/25/23	midterm II (material from lectures 8-17)		
19	W	03/27/23	isodose distributions		Schwarz
20	M	04/01/23	isodose distributions (LAB)		Schwarz
21	W	04/03/23	patient data, corrections, and setup	Khan Ch. 12	Schwarz
22	M	04/08/23	patient data, corrections, and setup		Schwarz
23	W	04/10/23	patient data, corrections, and setup (LAB) in Radiation Oncology department		Schwarz/ therapists
24	M	04/15/23	field shaping, skin dose, field separation	Khan Ch. 13	Schwarz
25	W	04/17/23	field shaping, skin dose, field separation		Schwarz
	M	04/22/23	final exam (cumulative, mainly lectures 16-25)		
	W	04/24/23	no class		