

Fall 2023

## Therapeutic Radiological Physics II

BME 6592; Section 1F22; 3 Credits

### CLASS MEETING INFO

11:00AM-11:50AM Mon/Wed/Fri; Radiation Oncology Conference Room

### INSTRUCTORS

Hardev S Grewal, PhD; [hgrewal@floridaproton.org](mailto:hgrewal@floridaproton.org); *Office hours by arrangement*  
 Twyla R Willoughby, PhD; [TRWilloughby@floridaproton.org](mailto:TRWilloughby@floridaproton.org); *Office hours by arrangement*  
 Perry B Johnson, PhD; [perryjohnson@ufl.edu](mailto:perryjohnson@ufl.edu); *Office hours by arrangement*

### TEACHING ASSISTANTS

### DESCRIPTION

Introductory graduate course in special treatment techniques and modern therapeutic radiation physics (3 Credits)

### PRE-REQUISITES/CO-REQUISITES

BME 6591 Therapeutic Radiological Physics I

### OBJECTIVES

To have the basic understanding and knowledge of some special topics in modern radiation therapy physics

### MATERIALS AND SUPPLY FEES

Covered by Tuition/Registration

### REQUIRED TEXTBOOK

The Physics of Radiation Therapy; Khan/Gibbons; Lippincott Williams and Wilkins; 5<sup>th</sup> Edition; ISBN# 978-1-4511-8245-3

### RECOMMENDED MATERIALS

Handouts or AAPM Task Group Reports to be distributed by instructor. It is recommended that students join American Association of Physicists in Medicine (AAPM) ([www.aapm.org](http://www.aapm.org)) as student members for free access to reports and other services. Also see [www.medicalphysicsweb.org](http://www.medicalphysicsweb.org) for literature and product information.

### COURSE SCHEDULE

Date	Topics	Lecturer	Reading
August 23, 2023	Electron I: Dosimetric parameters, Dose calculation	HG	-Khan ch.14 - AAPM TG-25: Clinical electron-beam dosimetry. - AAPM TG-70: Supplement to TG-25
August 25, 2023	Electron II: Output factors, source position, TSET	HG	
August 28, 2023	<a href="#">Lab I: Electron treatment planning demo</a>	HG/ Dosimetrist	
August 30, 2023	Brachytherapy I: Radioactive decay, sources	HG	-Khan ch.15 - AAPM TG-43: Dosimetry of Interstitial Brachytherapy Sources -AAPM TG-43 Update
September 1, 2023	Brachytherapy II: Calibration	HG	
September 6, 2023	Brachytherapy III: Dose calculations	HG	
September 8, 2023	LDR Brachytherapy: Dose implantation systems	PJ	
September 11, 2023	LDR prostate brachytherapy	PJ	-Khan ch.24

			- AAPM TG-137: Dose prescription and reporting methods for permanent interstitial brachytherapy for prostate cancer
September 13, 2023	HDR I	PJ	-Khan ch.23
September 15, 2023	HDR II	PJ	- AAPM TG-59: High dose rate brachytherapy treatment delivery
September 18, 2023	Electronic and intravascular brachytherapy, Eye plaque brachytherapy	PJ	-Khan ch.25 -TG-129: Dosimetry of 125I and 103Pd COMS eye plaques for intraocular tumors -AAPM TG-221: Practices for ocular plaque brachytherapy -AAPM TG-292: Electronic brachytherapy system
September 20, 2023	Lab II: HDR QA	Gainesville Physicist	
September 22, 2023	Exam 1		
September 25, 2023	Commissioning, calibration and quality assurance I	TW	-Khan ch.17 AAPM TG-106: Accelerator beam commissioning equipment procedure. - AAPM TG-51: Protocol for clinical dosimetry of high energy photon and electron beams.
September 27, 2023	Commissioning, calibration and quality assurance II	TW	-Khan ch.17 -AAPM TG-40: Comprehensive QA for Radiation Oncology - AAPM TG-142: Quality Assurance of medical accelerators -AAPM TG 198: An implementation guide for TG 142 quality assurance of medical accelerators
September 29, 2023	Commissioning, calibration and quality assurance III	TW	same as above
October 2, 2023	Commissioning, calibration and quality assurance IV	TW	-Khan ch.17 -AAPM TG-100: Application of risk analysis methods to radiation therapy quality management - ACR–AAPM technical standard for the performance of radiation oncology physics for external-beam therapy -AAPM TG 275: Strategies for effective physics plan and chart review in radiation therapy
October 4, 2023	Introduction to the model based photon dose calculation algorithm	HG	-Lecture notes
October 6, 2023	Homecoming		
October 9, 2023	Algorithm for clinical photon beams: Pencil beam, convolution & superposition methods	HG	
October 11, 2023	Monte Carlo algorithms for clinical photon beams	HG	
October 13, 2023	3D conformal radiation therapy IMRT/VMAT: Optimization and inverse planning	HG	-Khan ch.19-20 -AAPM TG-119: IMRT commissioning; Multiple institution planning and dosimetry and comparison - AAPM TG-120: Dosimetry tools and techniques for IMRT -AAPM TG 218: Tolerance limits and methodologies for IMRT measurement-based verification QA
October 16, 2023	IMRT/VMAT: Linac, Tomotherapy etc delivery systems	HG	
October 18, 2023	IMRT/VMAT: Commissioning, Patient specific QA	HG	
October 20, 2023	Lab III: IMRT/VMAT treatment planning demo	HG/ Dosimetrist	
October 23, 2023	Exam 2		
October 25, 2023	Total Body irradiation	TW	-Khan ch.18 -AAPM TG-29: The physical aspects of total and half body irradiation therapy.
October 27, 2023	IGRT I: EPID, 2D kV & MV image guidance	TW	-Khan ch.26 -AAPM TG-104: The Role of In-Room kV X-Ray Imaging for Patient Setup and Target Localization
October 30, 2023	IGRT II: CBCT, dose	TW	- AAPM TG-179: Quality assurance for image-guided radiation therapy utilizing CT-based technologies
November 1, 2023	IGRT III: Surface guided radiation therapy	TW	-AAPM TG 302: Surface-guided radiotherapy
November 3, 2023	Lab IV: Machine and Imaging QA	TW/HG	
November 6, 2023	MR in radiotherapy: Brief introduction to MRI imaging, MR Sim, MR linac, biomarkers, plan adaptation	Gainesville Physicist	2021 AAPM Summer School
November 8, 2023	Motion management in radiotherapy	TW	-AAPM TG -76: The Management of Respiratory Motion in Radiation Oncology

November 10, 2023	Veteran's Day		
November 13, 2023	Radiation protection in radiotherapy, pregnancy, Pacemaker/CIED	TW	-Khan ch.16 AAPM TG-203: Management of radiotherapy patients with implanted cardiac pacemakers and defibrillator - AAPM TG-36: Fetal Dose from Radiotherapy with Photon Beams
November 15, 2023	Proton therapy I: Physics, delivery systems	HG	Khan ch.27 -IAEA 398: Absorbed Dose Determination in External Beam Radiotherapy - Harald Paganetti, Proton Therapy Physics, CRC Press, 2020
November 17, 2023	Proton therapy II: Planning techniques, robust optimization	HG	
November 20, 2023	Proton Therapy III: Devices, calibration protocol, and QA	HG	
November 27, 2023	SRS: Introduction, setup immobilization, planning, indices + dedicated SRS systems.	TW	-Khan ch.21 -Khan ch.22 - AAPM TG-42: Stereotactic radiosurgery - AAPM TG-101: Stereotactic body radiation therapy - AAPM TG-178: Recommendations on the practice of calibration, dosimetry, and quality assurance for gamma stereotactic radiosurgery
November 29, 2023	SBRT	TW	
December 1, 2023	Task group presentations I (by students)	HG/TW	
December 6, 2023	Task group presentations II (by students)	HG/TW	
<b>TBD</b>	Lab V: UFPTI site visit: IMRT QA, Proton PBS QA	HG/TW	
December 11, 2023	<b>Exam 3</b>		

### ATTENDANCE POLICY; CLASS EXPECTATIONS; MAKE-UP POLICY

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 OF GRADES

Assigned work will be assessed by the instructor(s) and/or the teaching assistant(s). Final grades will be determined based on weighting indicated in the table below.

Assignment	Total Points	Percentage of Final Grade
Homework and Lab Reports	100	10%
Quizzes	100	5%
Exam 1	100	35%
Exam 2	100	25%
Exam 3	100	25%
		<b>Total: 100%</b>

#### Homework and Lab Reports:

Homework will be assigned based on Topics covered in the Class to include calculations for treatment settings, treatment plans, Calibration and quality assurance. For each of the four labs scheduled a summary lab report will be required. Homework and Labs will total 10% of the overall grade.

#### Quizzes:

In class quizzes will be given throughout the course. Quizzes will be 1-4 questions, designed to serve as a review of the material and collectively will make up 5% of the overall grade.

#### Exams:

Three exams will be given throughout the course. Exam will be a combination of short answer, short problems, and multiple choice. The exams will be for the subject material covered since the previous exam.

## GRADING POLICY

Percent	Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
59 & below	E

More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

## STUDENTS REQUIRING ACCOMMODATIONS

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

## EVALUATIONS

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/>.

## UNIVERSITY HONESTY POLICY

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

## SOFTWARE USE

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

## 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: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

## CAMPUS RESOURCES

### Health and Wellness

### U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member

of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center**

352-392-1575; <http://www.counseling.ufl.edu/cwc>

**Sexual Assault Recovery Services (SARS)**

352-392-1161; Student Health Care Center

**University Police Department**

352-392-1111 (or 911 for emergencies); <http://www.police.ufl.edu/>

**Academic Resources**

**E-learning Technical Support**

352-392-4357 (select option 2); [learning-support@ufl.edu](mailto:learning-support@ufl.edu); <https://lss.at.ufl.edu/help.shtml>

**Career Resource Center**

Career assistance and counseling.

352-392-1601; Reitz Union; <https://www.crc.ufl.edu/>

**Library Support**

Various ways to receive assistance with respect to using the libraries or finding resources. <http://cms.uflib.ufl.edu/ask>

**Teaching Center**

General study skills and tutoring.

352-392-2010 or 352-392-6420; Broward Hall; <https://teachingcenter.ufl.edu/>

**Writing Studio**

Help brainstorming, formatting, and writing papers.

352-846-1138; 302 Tigert Hall; <https://writing.ufl.edu/writing-studio/>

**Student Complaints Campus**

[https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)

**On-Line Students Complaints**

<http://www.distance.ufl.edu/student-complaint-process>