IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinator, Natalie Sirisaengtaksin, PhD. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

Term and Year: **Fall 2025** Course Number and Course Title: **GS02 1093: Introduction to Medical Physics I: Basic Interactions** **Credit Hours: 3** Meeting Location: **MD Anderson Main Campus** Building/Room#: **FCT14.5059 (Radiation Physics Classroom)** WebEx/Zoom Link: **NA**	**Program Required Course: Yes** **Approval Code: Yes** **(If yes,** the Course Director or the Course Designee will provide the approval code.) **Audit Permitted: Yes** **Classes Begin: August 25, 2025** **Classes End: December 5, 2025** **Final Exam Week: December 8 -12, 2025**

Class Meeting Schedule

Day	Time
Tuesday and Thursday **Friday**	**8:00 AM – 9:30 AM (Lectures)** **9:15 AM – 10 AM (Homework discussion)**

Course Director Name and Degree: Surendra Prajapati, PhD Title: Associate Professor Department: Radiation Physics Institution: *MDACC* Email Address: sprajapati1@mdanderson.org Contact Number: 832-468-8884 **NOTE:** Office hours are available by request. Please email me to arrange a time to meet. **Teaching Assistant**: Rebecca T Lim Email Address: rtlim@mdanderson.org	**Instructor/s** 1. Surendra Prajapati, PhD Institution: MDACC Email Address: sprajapati1@mdanderson.org 2. Erygs Subashi, PhD Institution: MDACC Email Address: edsubashi@mdanderson.org 3. Eun Young Han, PhD Institution: MDACC Email Address: ehan@mdanderson.org 4. Sara Thrower, PhD Institution: MDACC Email Address: slloupot@mdanderson.org

Course Description:
This course covers the basic interactions of ionizing and non-ionizing radiation important in medicine. Topics include production of radiation; photon, charged particle, and neutron interactions; exponential attenuation, radiation equilibrium, cavity theory and radioactive decay.

Textbook/Supplemental Reading Materials

The required text for the course is **Introduction to Radiological Physics and Radiation Dosimetry, by F.H. Att**ix. For a career in dosimetry sand radiation therapy, this book is a must have. Please let me know if you cannot find/get this book.

Supplemental textbooks:

- Fundamentals of ionizing Radiation Dosimetry by Andreo, Burns, Nahum, Seuntjens and Attix
- The Physics of Radiology by Harold E Johns and John R Cunningham
- Introductory Nuclear Physics by Crane

Course Objective/s:
Upon successful completion of this course, students will have a basic understanding about radiation, radiation interactions and its use in medicine. Topics covered include fundamental quantities and units, interactions of radiation with matter, and basic dosimetry.

Specific Learning Objectives:
1. Define the most common units of radiation measurements and identify how the definitions are connected to the measurements.
2. Learn to relate the various attenuation coefficients to the deposition of energy.
3. Learn to relate the various photon, neutron and charged particles (electron, protons) interaction processes to the deposition of energy.
4. Identify the pathways if radioactive decay and indicate where the emitted radiation deposits energy.

Student Responsibilities and Expectations:

Students are expected review the lecture materials prior to class. While you may work and discuss all course materials and assignments in groups, all writing assignments must be your own. Plagiarism and failure to properly cite scientific literature and other sources will not be tolerated and are grounds for dismissal from the course and further GSBS disciplinary action. Cheating or engaging in unethical behavior during examinations (quizzes, take home midterm and final exams) will be grounds for dismissal from the course without credit and further GSBS disciplinary action.

Lectures:
The lectures will be in -person in the classroom. Lecture materials will be provided on the CANVAS course website, where the course materials will be divided by week. Students will be asked to do post-lecture quizzes in CANVAS on a weekly basis. Week 1 quizzes will be due by end of day on Tuesday of Week 2. Homework problems will also be assigned weekly. Week 1 homework assignment will be due by 9 AM on

the Friday of Week 2, and so on. Week 1 homework will be presented on week 2 Friday class and so on: one problem per student on a rotating basis. Please come to class prepared to present a homework problem on Fridays. Medical physics is a discipline where interpersonal interaction and thinking "on your feet" is essential. We will also discuss pertinent highlights from the lectures and unclear points on Friday class as well. Students are encouraged to please submit any questions via email, and we will address the questions in class. During the course, if any quiz question, homework assignment question, or take-home exam question is not clear, please email respective instructor and course director for further clarification. Towards the end of the semester, students will be encouraged to do group presentation (group of ~ 3 students) on a research topic, which is part of the grade for class participation.

The need for care:
Medical physics is a discipline in which care, and meticulousness is essential, with dire consequences for sloppy work.

Exams:
Midterm will be take-home with 1 week time to complete the exam, and final exam will be comprehensive and in class for 2 hours.

Grading System: Letter Grade (A, B, C, D, F)
A: 90% - 100%
B: 70% - 89%
C: 60% - 69%
D: 50% - 59%
F: < 50 %

Student Assessment and Grading Criteria:

Percentage	Description
Homework (20%)	Weekly homework assignments due the Friday of the following week
Quiz (10%)	Weekly quiz assignments on CANVAS due Tuesday of the following week
Class participation and research presentation (10%)	Attendance in class, homework presentations+ discussions; medical physics clinical or research presentation (group project)
Midterm Exams (30%)	Take-home exam
Final Exam (30%)	Comprehensive in-class exam

Class Schedule:

Week	Week starting	Lecture Topic	Lecturer/s
1	26-Aug	Attix Chapter 1. Ionizing radiation	**Prajapati**

2	2-Sep	Attix Chapter 2. Quantities for describing interaction of ionizing radiation with matter	**Prajapati**
3	9-Sep	Attix Chapter 3. Exponential attenuation	**Subashi**
4	16-Sep	Attix Chapter 7. Gamma and x-ray interactions in matter (Thompson, Rayleigh, Photoelectric scattering)	**Subashi**
5	23-Sep	Attix Chapter 7. Gamma and x-ray interactions in matter (photo electric and Compton scattering)	**Prajapati**
6	30-Sep	Attix Chapter 7. Gamma and x-ray interactions in matter (Compton scattering, Pair production and photonuclear interaction)	**Prajapati**
7	7-Oct	Attix Chapter 8. Charged-particle interactions in matter (stopping power ratios)	**Thrower**
8	14-Oct	Attix Chapter 8. Charged-particle interactions in matter (Range, energy, mean stopping powers)	**Thrower**
9	21-Oct	Review and Attix Chapter 4. Charge particle and radiation equilibrium (**'Take Home' MIDTERM**)	**Prajapati**
10	28-Oct	Attix Chapter 5. Absorbed dose in radioactive Media	**Prajapati**
11	4-Nov	Attix Chapter 6. Radioactive decay	**Prajapati**
12	11-Nov	Attix Chapter 16. Neutron interactions and dosimetry	**Thrower**
13	18-Nov	Proton interactions and dosimetry	**Thrower**
14	25-Nov	NO CLASS THANKSGIVING	
15	2-Dec	Class presentations and Review	**Han/ Prajapati**
16	11-Dec	Review and **'in-Class' FINAL EXAM** Dec 10, 2025 (10 AM to noon)	**Prajapati**