Radiation Dosimetry I

The University of Toledo
Department of Radiation Oncology, COMLS
MPHY 6120/8120 (CRN: 56283/56269)

Instructor: Diana Shvydka
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Office Hours: By appointment
Office Location: DCC, room#2050F (HSC)
Instructor Phone: 419-383-5328
Offered: Fall, 2021

Class Location: Ruppert HC, suit K, #0005
Class Day/Time: M, 9:30AM-12:15PM
Credit Hours: 3
Course Website: Blackboard Learn; https://www.utoledo.edu/med/depts/radther/graduate/RadiationDosimetryII.html

SPECIAL COURSE EXPECTATIONS DURING COVID-19

Maintaining a safe campus during the ongoing COVID-19 pandemic remains a top priority. UToledo continues to follow the guidance of the U.S. Centers for Disease Control and Prevention and Ohio Department of Health to keep our campus safe.

ATTENDANCE: The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Before coming to campus each day, students should take their temperature and complete a self-assessment for symptoms of COVID-19, such as cough, chills, fatigue or shortness of breath. Anyone with a temperature at or above 100.0 degrees Fahrenheit or who is experiencing symptoms consistent with COVID-19 should not come to campus and contact their primary care physician or the University Health Center at 419.530.5549. For more information on the symptoms of COVID-19, please go to https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

COVID-19 testing for sick students is available on both Main Campus and Health Science Campus. Call 419.383.4545 for an appointment. Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences. Students should notify their instructors and follow the protocols summarized in this document on Navigating COVID-Related Course Concerns. In the event that you have tested positive for COVID-19 or have been diagnosed as a probable case, please review the CDC guidance on self-isolation and symptom monitoring, and report the disclosure to the Division of Student Affairs by emailing StudentAffairs@utoledo.edu or by connecting with their on-call representative at 419.343.9946. Disclosure is voluntary and will only be shared on a need to know basis with staff such as in the Office of Student Advocacy and Support, The Office of Residence Life, and/or the Office of Accessibility and Disability Resources to coordinate supportive measures and meet contact tracing requirements.

FACE COVERINGS: Face coverings are required while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. Students will not be permitted in class without a face covering. If you have a medical reason preventing you from wearing a face covering due to a health condition deemed high-risk by the CDC, submit an online application to request an accommodation through the Office of Accessibility and Disability Resources. Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. Students already affiliated with the Office of Accessibility and Disability Resources who would like to request additional accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs. You may connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

VACCINATION: Doctors and other health care professionals agree that the best way to protect ourselves and each other is to get vaccinated. Case data clearly show that vaccines remain highly effective at preventing serious illness from COVID, including the highly contagious delta variant. If you have not yet received your COVID vaccine, the University encourages you do so as soon as possible. No appointment is needed to get the shot at the UTMC Outpatient Pharmacy, University Health Clinic or Main Campus Pharmacy. Once you receive the COVID vaccination, please register on the COVID Vaccine Registry site at: https://utvaccinereg.utoledo.edu/.

SPECIAL NOTES: It's important to note, that based on the unpredictability of the COVID-19 virus, things can change at any time. So please be patient and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.

CATALOG/COURSE DESCRIPTION*

Series of lectures covering basic concepts of radiation physics, interactions of ionizing radiation with matter, and fundamentals of radiation dosimetry techniques and instrumentation. An overview of principles of radiation therapy, radiation protection, nuclear medicine, and diagnostic radiology is given.

COURSE OVERVIEW

Radiation Dosimetry I course offers an introduction into physics of high-energy photon and charged particle interactions with matter

STUDENT LEARNING OUTCOMES*

Upon successful completion of the course, the student will be able to:

1) Describe basic mechanisms of x-ray production, and approaches used for photon generation at kV and MV energies
2) Understand concepts of radioactivity, and apply equations governing nuclear decay processes
3) Describe the basic interactions between photons and charged particles with matter
4) Formulate main concepts of radiation dosimetry, including those of kerma, dose, and electronic equilibrium
5) List main techniques to measure radiation field, their advantages and limitations
6) Understand a system of dosimetric calculations, and basic principles of treatment planning for a single photon beam and a combination of beams
7) Understand concepts, terminology, and instrumentation used in nuclear medicine applications
8) Formulate basic principles of radiation protection; be able to conduct simple shielding calculations

TEACHING METHODOLOGY

The course is taught through regular lectures, discussion of homework problems, and answering student questions

PREREQUISITES AND COREQUISITES*

Consent of Department/Instructor

TEXTS AND ANCILLARY MATERIALS*

Main text: H. E. Johns and J. R. Cunningham, Physics of Radiology, 4th edition, Charles C. Thomas, 1983

Recommended supplemental material: H. E. Johns and J. R. Cunningham, Solutions to selected problems from the Physics of Radiology, Fourth Edition, Charles C. Thomas, 1991

Self-study text: E. B. Podgorsak, Compendium to Radiation Physics for Medical Physicists (Access to the e-book version is available through UT library)

TECHNOLOGY REQUIREMENTS

Students are expected to have basic computer skills, abilities to download lecture notes, and conduct communications through email

ACADEMIC POLICIES*

Graduate Policies: http://www.utoledo.edu/policies/academic/graduate/

COURSE EXPECTATIONS

Students are expected to attend all lectures, and solve all assigned homework problems. Regular correspondence pertaining to the course updates and announcements will be communicated through email

OVERVIEW OF COURSE GRADE ASSIGNMENT*

Grades will be determined based on relative performance of the class using the following scheme

6 quizzes (SLO 1-8)	50%
Mid-term exam (SLO 1-4)	25%
Final Exam (SLO 5-8)	25%
Total (SLO 1-8)	100%

Final Grading*

The final letter grades are derived according to the following grading scale:

96-100	90-95	86-89	80-85	76-79	70-75	66-69	60-65	50-59	>49
A	A-	B+	B	B-	C+	C	C-	D	F

COURSE SCHEDULE*

Chapters/Topics	*Date*	*Homework*	*Self-study*	*Exam/Quiz*
1-2. Review of basic concepts. Production and properties of x rays	08/30	Ch.1: 6,15,18,25,32 Ch.2: 7,10,16,19,20	1.13, 15, 21 4.1,2	
****Labor day – no class****	09/06			
3. The fundamentals of nuclear physics	09/13	2,13,18,20,21,24	1.28, 2.4, 5.2, 10.3,4	Quiz Ch. 1-2
4. High energy machines	09/20	4,5,7,8,9	13.1, 14.1,5,6	
5. The interaction of ionizing radiation with matter	09/27	1,10,11,16,19,24	8.1,3	Quiz Ch. 3-4
6. The basic interactions between photons and charged particles with matter	10/04	2,11,20,22,26,34	5.1, 6.2, 3 Intro's to 7.2,3,4,5,6	
7-8. Measurement of radiation: dosimetry concepts and theory. The quality of x rays	10/11	Ch7: 5,10,12,13,14 Ch8: 4,5,10,11	6.11 7.1	Quiz Ch. 5-6
9. Measurement of radiation: instrumentation and techniques	10/18	4,6,9,14,23,24		
Chapters 1-8	10/25			**Midterm Exam**
10. The interaction of single beams of x and gamma rays with scattering medium	11/01	5,7,9,12,13,15		
11. Treatment planning - single beam	11/08	2,3,5,7,9,11		Quiz Ch. 9-10
12. Treatment planning - combination of beams	11/15	4,5,7,8,12,18		
14. Nuclear medicine	11/22	1,2,8,10,12,15	1.31	Quiz Ch. 11-12
15. Radiation protection	11/29	2,3,4,5,6		
Proton beam therapy	12/06			Quiz Ch. 14-15
Chapters 9-12, 14, 15	12/13			**Final Exam**

Note: underscored problems are solved in "Solutions to selected problems from the Physics of Radiology, Fourth Edition" by H. E. Johns and J. R. Cunningham, Charles C. Thomas, 1991.

*Required

UNIVERSITY POLICIES*

Institutional Classroom Attendance Policy (Fall and Spring Statement)

Please be aware that the university has implemented an attendance policy, which requires faculty to verify student participation in every class a student is registered at the start of each new semester/course. For this course, if you have not attended/participated in class (completed any course activities or assignments) within the first 14 days, I am required by federal law to report you as not attended. Unfortunately, not attending/participating in class impacts your eligibility to receive financial aid, so it is VERY important that you attend class and complete course work in these first two weeks. Please contact me as soon as possible to discuss options and/or possible accommodations if you have any difficulty completing assignments within the first two weeks.

Policy Statement on Non-Discrimination on the Basis of Disability (ADA)*

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.
Students can find this policy along with other university policies listed by audience on the University Policy webpage (http://www.utoledo.edu/policies/audience.html/#students).

Academic Accommodations*

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an Accommodations Memo from the Office of Accessibility and Disability Resources, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course.

For students who have not established accommodations with the Office of Accessibility and Disability Resources and are experiencing disability access barriers or are interested in a referral to health care resources for a potential disability, please connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

ACADEMIC AND SUPPORT SERVICES*

Please follow this link to view a comprehensive list of Student Academic and Support Services (http://www.utoledo.edu/studentaffairs/departments.html) available to you as a student.

SAFETY AND HEALTH SERVICES FOR UT STUDENTS*

Please use the following link to view a comprehensive list Campus Health and Safety Services available to you as a student.

INCLUSIVE CLASSROOM STATEMENT

In this class, we will work together to develop a learning community that is inclusive and respectful. Our diversity may be reflected by differences in race, culture, age, religion, sexual orientation, gender identity/expression, socioeconomic background, and a myriad of other social identities and life experiences. We will encourage and appreciate expressions of different ideas, opinions, and beliefs so that conversations and interactions that could potentially be divisive turn, instead, into opportunities for intellectual and personal development.