

Fundamental Aspects of Radiation Shielding

ENU 4630, Section 7689

Class Periods: Tuesday, Period 6 and 7, 12:50 p.m. – 2:45 p.m.
Thursday, Period 6, 12:50 p.m. – 1:40 p.m.

Location: Tuesday, Rinker, Room 2354
Thursday, Rinker, Room 0279

Academic Term: Fall 2025

Instructor:

Dr. Donald Wall

Donald.wall@ufl.edu Phone:

352-273-2662

Office location: UFTR

Office Hours: Wednesdays

8:00 – 9:00 a.m.

UFTR facility

Teaching Assistants:

- none

Course Description

Three one-hour lectures discussing basic principles of radiation shielding. Study of radiation sources and shielding design of radiation facilities.

Course Pre-Requisites / Co-Requisites

ENU 4605 with a minimum grade of C.

Course Objectives

The course objectives include comprehension and proficiency in the following topics:

- Determining the shielding requirements that are necessary to provide protection against radiation
- Using the knowledge of the characteristics of shielding materials to determine appropriate shielding design
- Incorporating calculations into the shielding design process to determine an optimum shielding model that provides an appropriate protection for workers, the environment and the public

The course objectives will be addressed by means of:

- textbook study
- lecture material that will compliment and clarify the textbook material
- provide examples of applications, including some in-class problem solving exercises
- assigned problems, with emphasis on problems that have applications in the field

Materials and Supply Fees

none

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	High
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Specifically, the aspect of ABET Outcome 4 will be assessed according to the following criteria: Makes informed judgements considering impact of engineering solutions in global, economic, environmental, and/or societal context.

Required Textbooks and Software

- Radiation Shielding (2000)
- J. Kenneth Shultis, Richard E. Faw
- American Nuclear Society, ISBN: 0-89448-456-7
- 978-3-527-40606-7

Recommended Materials

- Nuclides and Isotopes, Chart of the Nuclides
Published by Knolls Atomic Power Laboratory
Publication date: 2010, 17th Edition

Printed copies of the Chart of the Nuclides have been unavailable in recent years, with older copies being very expensive. A pdf file with the necessary information for this class will be posted on Canvas. There are also some useful websites and apps that are appropriate for this course.

Additional reading will be posted on Canvas as pdf files, and will include:

- *Reactor Shielding for Nuclear Engineers*
- *Title 10 Code of Federal Regulations, Part 20*
- *Exposure Rate Constants and Lead Shielding Values for Over 1,100 Radionuclides*
- *Radionuclide Transformations: ICRP Publication 38*
- *Additional publications as the need arises*

Course Schedule

Date	Subject	Comments and Due Dates
Week 1 (Aug 21)	Course introduction Radiation dosimetry	
Week 2 (Aug 26 & 28)	Radiation dosimetry Code of Federal Regs.	
Week 3 (Sept 2 & 4)	Charged particles	Assignment 1, Sept 2
Week 4 (Sept 9 & 11)	Exam 1, Sept 9. No class Sept. 11	
Week 5 (Sept 16 & 18)	γ -ray exposure	
Week 6 (Sept 23 & 25)	Photon interactions and shielding	
Week 7 (Sept 30 & Oct 2)	Photon interactions and shielding	Assignment 2, Sept 30
Week 8 (Oct 7 & 9)	Photon interactions and shielding	
Week 9 (Oct 14 & 16)	Exam 2, October 14	
Week 10 (Oct 21 & 23)	Albedo, ducts, void, streaming	
Week 11 (Oct 28 & 30)	Neutrons and criticality safety	
Week 12 (Nov 4 & 6)	Neutrons and criticality safety	Assignment 3, Nov 4
Week 13 (Nov. 11 & 13) No Class Nov. 11 (Holiday)	Review	
Week 14 (Nov 18 & 20)	Exam 3, Nov. 18	
Week of Nov 24 - 28	Thanksgiving week, no classes	
Week 15 (Dec 2 last class period)	Review and closeout. Course evaluations.	Assignment 4, Dec 2
December 10	Final Exam	

Required Computer

Recommended Computer Specifications: <https://it.ufl.edu/get-help/student-computer-recommendations/>

HWCOE Computer Requirements: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

Important Dates

September 9	Exam 1
October 14	Exam 2
November 18	Exam 3
December 10	Final Exam (8:00 – 10:00 pm, Location TBA)

Evaluation of Grades

Assignment	Points	Total Points	Percentage of Final Grade
Assignments (4)	20 each	80	40%
Exam 1	30	30	15%
Exam 2	30	30	15%
Exam 3	30	30	15%
Final Exam	30	30	15%
	Total →	200	100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Attendance Policy. Attendance is not mandatory. Grades do not take attendance into account.

Makeup Exam Policy. Make up exams will be given in accordance with university policy.

Assignments. Assignments must be submitted via Canvas. Late assignments will not be accepted. Note carefully the time that the assignment is due—any assignment turned in after the due date and time gets flagged by Canvas as submitted late, and will not be accepted and will get a score of zero for the assignment. Also note that a late assignment, with a score of zero, has a significant impact on the course grade.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Legibility. *Assignments or portions of assignments, (including quizzes) that are illegible will receive zero credit.* As a guideline, difficult to read (or messy) = illegible.

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: <https://go.ufl.edu/syllabuspolices>. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu