

Spring 2023

Medical Radiation Protection and Shielding

ENU 6636; Section 19089; 3 Credits

CLASS MEETING INFO

9:30^{AM} to 10:20^{AM} Monday, Wednesday & Friday
Room C2-33 (Leon) and Zoom (Johnson)

INSTRUCTORS

Stephanie Leon, PhD; leons@radiology.ufl.edu; (352) 594-2492
Perry Johnson, PhD; PBJohnson@floridaproton.org; (904) 588-1253
Office Hours: by appointment

TEACHING ASSISTANTS

TJ Moretti, MS; tmor0009@radiology.ufl.edu
Office Hours: by appointment

COURSE DESCRIPTION

3 credits. Radiation protection practices and fundamentals of radiation shielding design and verification for medical applications in radiation therapy, diagnostic and interventional imaging, and nuclear medicine.

PRE-REQUISITES

BME 6535: Radiological Physics, Measurements and Dosimetry
ENU 6652: Diagnostic Radiological Physics II
ENU 6659: Nuclear Medicine Instrumentation and Procedure
BME 6591: Therapeutic Radiological Physics I

OBJECTIVES

1. Students will become familiar with and interpret the various regulations regarding radiation protection
2. Students will compare the use of various survey meters
3. Students will identify and apply the shielding methodologies for medical radiological facilities
4. Students will design a shielding project and present their design to the class
5. Students will construct a professional shielding report

REQUIRED TEXTBOOKS & SOFTWARE

1. National Council on Radiation Protection, Report Number 151, Structural Shielding Design and Evaluation for X- and Gamma-Ray Radiotherapy Facilities, 2005 ISBN 0-929600-87-8
2. National Council on Radiation Protection, Report Number 147, Structural Shielding Design for Medical X-Ray Imaging Facilities, 2004 ISBN 0-929600-83-5

MATERIALS AND SUPPLY FEES

None

RECOMMENDED MATERIALS

None

COURSE SCHEDULE

Date	Topic	Instructor
Monday, Jan 9	History of Radiation Protection	Leon
Wednesday, Jan 11	Background Radiation, the ALARA Principle, and Risk	Leon
Friday, Jan 13	Regulations and Dose Monitoring	Leon
Monday, Jan 16	UF Holiday – No class	
Wednesday, Jan 18	Radiation Survey Meters	Leon
Friday, Jan 20	Survey Meters Lab (in class)	Leon
Monday, Jan 23	Analytic Shielding with Simple Geometry	Leon
Wednesday, Jan 25	Analytic Shielding (<i>continued</i>)	Leon
Friday, Jan 27	Analytic Shielding (<i>continued</i>) and Materials	Leon
Monday, Jan 30	Radiation Protection in Diagnostic Radiology	Leon
Wednesday, Feb 1	Intro to Diagnostic Shielding	Leon
Friday, Feb 3	Intro to Diagnostic Shielding (<i>continued</i>)	Leon
Monday, Feb 6	Radiography Shielding	Leon
Wednesday, Feb 8	Shielding for Fluoroscopy and R&F Rooms	Leon
Friday, Feb 10	Shielding for Mobile Units, Mammography, and Dental units	Leon
Monday, Feb 13	CT Shielding	Leon
Wednesday, Feb 15	CT Shielding (<i>continued</i>)	Leon
Friday, Feb 17	Shielding Reports and Facility Design	Leon
Monday, Feb 20	Shielding Verification and Facility Surveys	Leon
Wednesday, Feb 22	The nuclear medicine environment	Leon
Friday, Feb 24	Student Presentations – Diagnostic Shielding Project	Leon
Monday, Feb 27	Student Presentations – Diagnostic Shielding Project	Leon
Wednesday, Mar 1	Radiation Protection in NM	Leon
Friday, Mar 3	TG-108 for PET	Leon
Monday, Mar 6	No class	
Wednesday, Mar 8	More Room Shielding in NM	Leon
Friday, Mar 10	Dosimetry and Monitoring in NM	Leon
Monday, Mar 13	UF Spring Break – No class	
Wednesday, Mar 15	UF Spring Break – No class	
Friday, Mar 17	UF Spring Break – No class	
Monday, Mar 20	More Regulations in Nuclear Medicine	Leon
Wednesday, Mar 22	Radiation Safety in Radionuclide Therapy	Brown
Friday, Mar 24	Review of Radiation Therapy Modalities	Johnson
Monday, Mar 27	NCRP 151 Formalism - Overview	Johnson
Wednesday, Mar 29	NCRP 151 Formalism - Overview (<i>continued</i>)	Johnson
Friday, Mar 31	Primary Barrier Shielding	Johnson
Monday, Apr 3	Secondary Barrier Shielding	Johnson
Wednesday, Apr 5	Two Source Rule, TADR, Shielding Surveys	Johnson
Friday, Apr 7	Review for Exam 1	Johnson
Monday, Apr 10	Exam 1 (covers content March 24 – April 7)	Johnson
Wednesday, Apr 12	Dose Equivalent at Door for Linacs up to 10 MV	Johnson
Friday, Apr 14	Dose Equivalent at Door for Linacs above 10 MV	Johnson

Monday, Apr 17	Door & Maze Design, Ductwork, Skyshine & Groundshine	Johnson
Wednesday, Apr 19	Shielding for Tomotherapy, Halcyon, and Cyberknife	Johnson
Friday, Apr 21	Shielding for HDR and GammaKnife	Johnson
Monday, Apr 24	Shielding Proton Therapy	Johnson
Wednesday, Apr 26	Review for Exam 2	Johnson
Wednesday, May 3	Exam 2 (covers content April 12 – April 26)	Johnson

ASSIGNMENTS AND EXAMS

There will be a total of 5 homework assignments that cover material from the class lectures. Each homework assignment is weighted equally. Homework assignments focus on reading and applying regulations, analyzing measurements acquired with survey meters, and practicing shielding calculations and radiation protection principles.

There are 2 projects:

1. Diagnostic shielding project – each student will be assigned a floor plan and equipment plan from the installation of one of these room types: radiography, fluoroscopy, R&F, mammography, or CT. Students will design the shielding for their assigned room and will present their calculations and design in a 10-15 minute presentation to the class. Both the presentation and the calculations must be turned in to be graded.
2. Nuclear medicine shielding project – each student will be assigned a floor plan and equipment plan from the installation of a PET/CT room. Students will design the shielding for their assigned room and will create an appropriate shielding report. Calculations must be included as an appendix to the report.

There will be a total of 2 exams, which are not cumulative. Each exam will cover content from the therapy shielding portion of the course, as indicated on the syllabus.

ATTENDANCE POLICY; CLASS EXPECTATIONS; MAKE-UP POLICY

Students are expected to attend each class period. Periods which may be missed should be brought to the attention of the Instructor as far in advance of the class period as possible. In the event of an unexcused absence, it is the student's responsibility to obtain and review the material that was covered during that class period.

Lectures are broadcast live online and also recorded. Students who are feeling unwell, who are under quarantine, or who are "withheld from campus" are required to stay home and may attend the live online lectures if they are feeling up to it, *with prior notification to the instructor*. Access to the recorded lectures is by instructor permission only. Documentation supporting the reason why access is needed may be requested.

Make-up laboratory exercises and assignments will only be considered for exceptional circumstances and will be implemented by the instructor on a case-by-case basis.

Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>

EVALUATION METHODS

Graded homework assignments:	20%
Diagnostic shielding project:	25%
Nuclear medicine shielding project:	25%
Therapy shielding exams (2):	30%

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 the UF grading policy may be found in the UF Graduate Catalog: <https://gradcatalog.ufl.edu/graduate/>

STUDENTS REQUIRING ACCOMMODATIONS

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center: <https://disability.ufl.edu/get-started/>. Once registered, students will receive an accommodation letter which must be presented to, and discussed with, the instructor when requesting accommodation. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-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 Student Conduct 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. 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

Email: umatter@ufl.edu, Phone: 352-392-1575; Website: <https://umatter.ufl.edu/>

Counseling and Wellness Center

Phone: 352-392-1575; Website: <https://counseling.ufl.edu/>

Student Health Care Center:

Phone: 352-392-1161; Website: <https://shcc.ufl.edu/>

University Police Department

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

UF Health Shands Emergency Room/Trauma Center

Phone: 352-733-0111; Website: <https://ufhealth.org/emergency-room-trauma-center>

Location: 1515 SW Archer Road, Gainesville, FL, 32608

GatorWell Health Promotion Services

Phone: 352-273-4450; Website: <https://gatorwell.ufsa.ufl.edu/>

Academic Resources**E-learning Technical Support**

Email: helpdesk@ufl.edu; Phone: 352-392-4357; Website: <https://helpdesk.ufl.edu/>

Career Connections Center

Phone: 352-392-1601; Website: <https://career.ufl.edu/>

Location: Reitz Union, Suite 1300

Library Support

Website: <https://uflib.ufl.edu/>

Teaching Center

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

Location: Broward Hall

Writing Studio

Phone: 352-846-1138; Website: <https://writing.ufl.edu/writing-studio/>

Location: 2215 Turlington Hall

Student Complaints (On-Campus)

Website: <https://sccr.dso.ufl.edu/policies/student-honor-%20code-student-conduct-code/>

Student Complaints (On-Line)

Website: <https://distance.ufl.edu/state-authorization-status/#student-complaint>