

HPS 720 RADIATION DOSIMETRY (3 credits)

Fall 2015, Monday 2:30PM - 5:15PM, WRI 323

Instructor: Professor Francis A. Cucinotta, BHS 342, (702) 895-0977
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Office Hours: Monday 12:30-1:30 PM; Wed. 3:00 – 4:00 PM
or By appointment

Prerequisite: HPS 701 or consent of instructor

Description: Mathematical treatment of the fundamental principles of internal and external radiation dosimetry. Pathway models and bioassay techniques studied to support the calculation of radiation dose from the intake of radioactivity. General external dosimetry from a variety of industrial and medical sources is addressed.

Concepts that will be covered include: dosimetry quantities and units, calculations for external radiation (gamma, beta, and neutron sources), calculation of dose from internal radioactivity, dose measurement concepts, gamma and beta dose measurements, dose assessment from survey and personnel monitoring.

Textbook: Frank H. Attix
Introduction to Radiological Physics and Radiation Dosimetry
John Wiley & Sons, New York, 1986

References: Various NCRP, ICRP, and ICRU Reports

Objectives: To provide an introduction to radiation dosimetry with special applicability to health and medical physics.

- 1) Understand the characteristics of radiation.
- 2) Investigate concepts and limitations associated with ICRU radiometry quantities and recent developments in microdosimetry to account for these limitations.
- 3) Understand principles of internal radiation dosimetry per ICRP/NCRP methodologies.
- 4) Utilize the MIRD schema to perform internal dose calculations.

Homework:

Reading and homework assignments will be given on a weekly basis. Homework assignments are due at the start of the class period and no allowances will be made for late homework. Understanding of the material will be assessed by in-class questioning.

Exams:

All exams will be closed book. You are expected to know the material well. Reasonable effort is expected from each student. If you need assistance in understanding the material, please ask for it. Students must take each examination at the scheduled time. If a student is unable to take an examination at the scheduled time, the student must contact the course instructor in writing, in advance, to inform him they will need to take the examination early. Failure to take the midterm will result in a zero for the exam. Students must take the final exam at the scheduled time without exception.

Grade Distributions:

Exam 1	25%
Exam 2	25%
Final Exam	30%
Homework	20%

A = 93-100	C = 74-77
A- = 90-92	C- = 71-73
B+ = 87-89	D+ = 68-70
B = 84-86	D = 65-67
B- = 81-83	D- = 62-64
C+ = 78-80	F = 0-61

Please remember that you must maintain a minimum of 3.0 GPA each semester as a graduate student (i.e. at least \geq B for each course).

Class Schedule: Mo 2:30 PM - 5:15PM, WRI 323

Date	Topic	Chapters in Attix book
8/24	Ionizing Radiation	1
	Quantities for Describing the Interaction of Interaction of Ionizing Radiation with Matter	2
8/31	Exponential Attenuation	3
	Charged-Particle and Radiation Equilibria	4
9/7	Labor Day Holiday	
9/14	Absorbed Dose in Radioactive Media	5
	Radioactive Decay	6
9/21	Exam#1 (Chapters 1-6)	
9/28	Gamma- and X-ray Interactions in Matter	7
	Charged-particle Interactions in Matter	8
10/5	X-ray Production and Quality	9
	Cavity Theory	10
10/12	Dosimetry Fundamentals	11
	Ionization Chambers	12
10/19	Dosimetry and Calibration of Photon and Electron Beams with Cavity Ion Chambers	13
	Integrating Dosimeters	14
10/26	Dosimetry by Pulse-Mode Detectors	15
	Neutron Interactions and Dosimetry	16
11/2	Exam #2 (Chapters 7-14)	
11/9	Beta Particle Dosimetry, Radionuclide Pathways / ICRP 30 Methodology	Handout
11/16	Bone Dosimetry, Lung Dosimetry / GI Tract Model / MIRD Methodology	Handout
11/23	Bioassay / Biological Dosimetry	Handout
11/30	Study week	
12/7	Final Exam	

University Policies:

Academic Misconduct – Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution.

An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the *Student Academic Misconduct Policy* (approved December 9, 2005) located at: <http://studentconduct.unlv.edu/misconduct/policy.html>.

Copyright – The University requires all members of the University Community to familiarize themselves and to follow copyright and fair use requirements. **You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws.** Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://provost.unlv.edu/copyright/statements.html>.

Disability Resource Center (DRC) – The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu/>, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you.

If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to me during office hours so that we may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach me before or after class to discuss your accommodation needs.

Religious Holidays Policy – Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The **make-up** will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor no later than the end of the first two weeks of classes, **September 6**, of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the test or examination at an alternate time would impose an undue hardship on the instructor or the university that could not reasonably be avoided. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=4&navoid=164>.

Incomplete Grades - The grade of I – Incomplete – can be granted when a student has satisfactorily completed all course work up to the withdrawal date of that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. A student who receives an I is

responsible for making up whatever work was lacking at the end of the semester. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade.

Tutoring – The Academic Success Center (ASC) provides tutoring and academic assistance for all UNLV students taking UNLV courses. Students are encouraged to stop by the ASC to learn more about subjects offered, tutoring times and other academic resources. The ASC is located across from the Student Services Complex (SSC). Students may learn more about tutoring services by calling (702) 895-3177 or visiting the tutoring web site at: <http://academicsuccess.unlv.edu/tutoring/>.

UNLV Writing Center – One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 895-3908. The student's Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: <http://writingcenter.unlv.edu/>

Rebelmail – By policy, faculty and staff should e-mail students' Rebelmail accounts only. Rebelmail is UNLV's official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students' e-mail prefixes are listed on class rosters. The suffix is always @unlv.nevada.edu.

Library Resources – Students may consult with a librarian (www.library.unlv.edu/ consultation) about research needs. For this class, the subject librarian is Xan Goodman. UNLV Libraries provides resources to support students' access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at www.library.unlv.edu/

Final Examinations – The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. See the schedule at: <http://www.unlv.edu/registrar/calendars>.

Any other class specific information - (e.g., absences, make-up exams, extra credit policies, plagiarism/cheating consequences, policy on electronic devices, specialized department or college tutoring programs, bringing children to class, policy on recording classroom lectures, etc.)