

University of Nevada, Las Vegas
School of Allied Health Sciences
Department of Health Physics & Diagnostic Sciences

- Course Number:** HPS 730
- Course Title:** Advanced Radiation Biology
- Instructor:** Dr. Steen Madsen (Rm. 347, x1805, steen.madsen@unlv.edu)
Office hours: by appointment.
- Prerequisite:** None
- Credit Hours:** 3
- Description:** Topics covered include: physics and chemistry of radiation absorption, radiation-induced DNA damage and repair, chromosome aberrations, cell survival curves, linear energy transfer, relative biological effectiveness, physical and chemical modifiers of radioactivity, fractionation and the dose-rate effect, radiation effects on normal tissues, time, dose and fractionation in radiotherapy, effects of radiation on the whole body and the fetus, basic principles of radiation protection, doses and risks in diagnostic procedures.
- Schedule:** Tuesdays 2:30 – 5:15 pm; CBC-C211
- Course Objectives:** To provide the student with an in-depth understanding of the basic radiobiological principles of relevance to the health and medical physics fields. Problem sets and assignments will be used to enhance student understanding of these concepts. Specifically, upon completion of the course, the student will have an understanding of:
- (1) The underlying physical effects associated with the interaction of ionizing radiation with biological materials.
 - (2) The basic principles of radiation chemistry and how the chemical species produced as a result of excitation and ionization events interact with molecules of biological significance.
 - (3) Cell survival curves and the relative radiosensitivity of various cell types under a number of irradiation conditions.
 - (4) The limitations of using radiobiological data in the area of radiation protection.

- (5) The health effects of ionizing radiation at low doses, including genetic effects, carcinogenesis, and pre-natal developmental effects.
- (6) The health effects of ionizing radiation at high doses as part of an acute radiation syndrome.

Instructional Methodology:

- 1. Teaching Methods
 - a. Lectures
 - b. Assignments/problem sets
- 2. Teaching Aids
 - a. Whiteboard
 - b. Overheads/slides
 - c. Handouts
- 3. Students will be responsible for
 - a. All lecture material
 - b. All assignments and problem sets

Student Evaluation:

The grades are distributed as follows:

Exam #1	– 35%
Exam #2	– 35%
Project	– 20%
Assignments	– 10%

Students unable to take exam #1 at the designated time will be given the opportunity to take it within one week of the regularly scheduled exam. If a student fails to take the exam within the one week grace period, he/she will fail the exam. Students must take exam #2 at the scheduled time without exception

Grading:

<i>Grade Points</i>	<i>Letter Grade</i>
94+	A
90-93	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
60-69	D
<60	F

Required Texts* and Supplemental Reading:

*Hall, E, Giaccia, A. J., *Radiobiology for the Radiologist*, 7th Edition, Lippincott Williams & Wilkins (2012)

Joiner, M, van der Kogel, A., *Basic Clinical Radiobiology*, 4th Edition, CRC Press (2009)

Outline of Instruction (Tentative):

Date	Topic
Aug. 25	Overview of radiation biology: therapeutic index, radiation-induced DNA damage and repair, the cell cycle, molecular checkpoint genes, chromosome aberrations
Sept. 1	Cell death and cell survival curves
8	Dose-response relationships in radiotherapy
15	LET, RBE, new radiation modalities
22	Physical and chemical modifiers of radiosensitivity: the oxygen effect, hypoxia, reoxygenation
29	Physical and chemical modifiers of radiosensitivity: radiosensitizers, radioprotectors
Oct. 6	Exam #1
13	Fractionation and the dose-rate effect
20	Effects on normal tissues
27	Time, dose and fractionation in radiotherapy
Nov. 3	Effects of irradiation on the human body: syndromes
10	Effects of irradiation on the human body: hereditary effects
17	Effects on the embryo and fetus
24	Radiation protection; Doses and risks in diagnostic procedures
Dec. 1	Presentations
8	Exam #2

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 Student 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>.

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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://www.unlv.edu/provost/copyright>.

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 the instructor during office hours so that you 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 the instructor 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 22, 2015** of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

Incomplete Grades - The grade of I – Incomplete – can be granted when a student has satisfactorily completed three-fourths of course work for 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. The incomplete work must be made up before the end of the following regular 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. Please note – Students cannot enroll in other nursing courses if they have an incomplete (I) in a course that is designated as a prerequisite to that course. (Per School of Nursing Policy C-12).

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 702-895-3908. 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](mailto:unlv.nevada.edu). Emailing within WebCampus is acceptable.

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/