EEE 598 ST: RADIATION EFFECTS

Instructor: Dr. Keith E. Holbert E-mail: Holbert@asu.edu
Office Hours: MW, 1:15-2:00 p.m. and TTh, 9:00-10:00 a.m. in ERC 581; 965-8594

Class Meeting Info: TTh, 10:40-11:55 a.m. in BAC 328
Semester Exams: Scheduled for September 22 and October 27
Final Exam: Friday, December 9, 2005 from 10:00-11:50 a.m.

Textbook: No textbook will be required for this course. Reading and reference materials shall consist of instructor written materials and reference papers available from various sources (primarily through the ASU Libraries subscription to IEEE Xplore).

Course Webpage: https://myasucourses.asu.edu/

Course Description and Objectives:

This course is intended to provide a firm foundation regarding basic radiation effects on materials, especially those related to engineering. The semester will begin by solidifying background information on radiation and its fundamental interactions and the pertinent physics. Afterwards, the macroscopic effects of radiation on various materials will be explored. An ultimate course goal is for the student to apply these concepts to the design of electronic systems for use in harsh radiation environments, such as those of extraterrestrial space. Prerequisite: graduate student standing in engineering or physics.

Topics: Broken into three basic divisions for the semester as given below:

I. Fundamentals of Radiation Physics
II. Radiation Damage Mechanisms
III. Radiation Effects on Electronics

Grading

Homework	30%
Semester Exams (2)	40%
Final Exam	30%

Homework: The homework assignments will be posted on the course webpage. Homework is expected to be turned in on-time, which is defined as before the start of class on the due day. Presentation and methods for arriving at the answer are just as important as the mathematical answer; solutions should be neat and logical. For complete credit: (1) show all work, and (2) box the answer and include the units. Students may work together on the homework, but copying is unacceptable: the ASU *Academic Integrity Policy* (AIP) is incorporated herein by reference.

Email: Important information may be sent to students via their ASU email account. Be sure to read your ASU email or forward it to an email account that you do regularly read.

Conduct: Thank you in advance for adhering to the ASU *Student Code of Conduct* and preventing *disruptive classroom behavior*, such as cell phone ringing, arriving late to class, and irrelevant side conversations.

EEE 598 SEMESTER TEACHING PLAN (TTh, Fall 2005)

The reading assignments listed at the course website should be read **before** the class meeting that day.

Week	Date	Lecture Topic	Homework
1	8/23	Overview; Radiation; Terminology/Definitions; History	
	8/25	Radiation physics	
2	8/30	Photon interactions	Hmwk #1 Due
	9/1	Neutron and charged particle interactions	
3	9/6	Charged particle interactions cont'd	
	9/8	Fundamental radiation effects	Hmwk #2 Due
4	9/13	Radiation effects on matter	
	9/15	Biological effects of radiation	Hmwk #3 Due
5	9/20	Review for Exam #1	
	9/22	*** Exam #1 ***	
6	9/27	Space radiation environment	
	9/29	Basic radiation damage to materials	
7	10/4	Radiation effects on electronics	Hmwk #4 Due
	10/6	Displacement damage	
8	10/11	Total ionizing dose; ELDRS	
	10/13	Single event effects	Hmwk #5 Due
9	10/18	Natural radioactivity; Soft errors	
	10/20	Beneficial uses of radiation (e.g., photovoltaics)	Hmwk #6 Due
10	10/25	Review for Exam #2	
	10/27	*** Exam #2 ***	
11	11/1	Radiation effects on electronic devices	
	11/3	Radiation effects on circuits	
12	11/8	Radiation hardness assurance testing	Hmwk #7 Due
	11/10	Radiation hard design approaches	
13	11/15	Spacecraft charging	
	11/17	Computer simulation	Hmwk #8 Due
14	11/22	Shielding calculations	
	11/24	### Thanksgiving Holiday ###	
15	11/29	Radiation measurement instrumentation	
	12/1	Enhanced radiation environment; EMP	Hmwk #9 Due
16	12/6	Review for Final Exam	
	12/7	--- Reading Day ---	
	12/9	*** Final Exam ***	