

EEE 460 NUCLEAR POWER ENGINEERING

Instructor: Dr. Keith E. Holbert Email: Holbert@asu.edu
Office Hours: MTWTh, 1:30-2:30 p.m. in ENGRC 581; (480) 965-8594
Class Meeting Info: TTh, 10:30–11:45 a.m. in COOR L1-10
Exams: Midterm: Thursday, March 5; Final: Tuesday, May 5 at 9:50–11:40 am

This is the face-to-face section of this course.

Textbook: R. L. Murray and K. E. Holbert, *Nuclear Energy: An Introduction to the Concepts, Systems, and Applications of Nuclear Processes*, 8th ed., Elsevier Butterworth-Heinemann, 2019.

Course Webpage: Lecture slides, homework and solutions posted on Canvas. Other useful info at <http://holbert.faculty.asu.edu/eee460/eee460.html>

Course Objective: Provide students with an understanding of the multidisciplinary applications of nuclear concepts in the engineering profession.
The corresponding Course Outcomes are

- Students will have usable knowledge of the physics behind nuclear concepts
- Students will understand the effects and uses of radiation
- Students will understand the principles of power generation via nuclear processes

Course Description: Radioactivity and decay. Radiation interactions and dose. Nuclear reaction, fission and fusion theory. Fission reactors, four factor formula, moderation. Nuclear power, TMI, Chernobyl. Nuclear fuel cycle.
Prerequisites: CHM 114 (or 116); MAT 274 (or 275); PHY 241 (or 361).

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

- I. Nuclear Fundamentals (Chaps. 1–6, 8)
- II. Nuclear Radiation (Chaps. 10–11)
- III. Nuclear Power (Chaps. 16, 18, 20–23)

Grading: “Standard” scale (with \pm) using 90-100 "A", 80-90 "B", 70-80 "C", etc.

Homework	25%
Midterm Exam	35%
Final Exam	40%

Note that each student’s final homework average will be limited to a maximum of 150% of the mean of his/her exam scores.

Homework: The homework assignments will be posted online. Homework is expected to be turned in on time. Homework will need to be scanned (preferably in black & white in most cases) into a pdf or Word doc file. Presentation and methods for arriving at the answer are just as important as the mathematical answer; solutions should be neat, legible and logical. For complete credit: (1) show all your 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), see <http://provost.asu.edu/academicintegrity>, is incorporated herein by reference.

EEE 460 TEACHING PLAN

(Session C, Spring 2020)

The textbook sections (given in parenthesis below) should be read **before** class. The homework due dates and test dates are mandatory (highlighted below in yellow and magenta, respectively).

Week	Date	Lecture Topics	Homework
1	1/14	Course Introduction; Energy (1.1–1.7)	
	1/16	Atomic Number Density (2.1–2.2)	
2	1/21	Atoms and Nuclei; Binding Energy (2.3–2.8)	Hmwk # 1 Due
	1/23	Nuclear Stability; Radioactive Decay (3.1–3.2)	
3	1/28	Decay Quantities; Simple Decay (3.3)	Hmwk # 2 Due
	1/30	Transmutation; Compound Decay; Radioactive Chains (3.4–3.6)	
4	2/ 4	Nuclear Reactions and Energetics (4.1–4.2)	Hmwk # 3 Due
	2/ 6	Binary Reactions; Neutron Cross Sections (4.3, 4.6)	
5	2/11	Neutron Flux; Reaction Rates (4.4)	Hmwk # 4 Due
	2/13	Particle Attenuation; Neutron Migration (4.5, 4.7–4.8)	
6	2/18	Charged Particle Interactions (5.1–5.3)	Hmwk # 5 Due
	2/20	Neutral Particle Interactions (5.4–5.7)	
7	2/25	Fission (6.1–6.5)	Hmwk # 6 Due
	2/27	Nuclear History (8.1–8.8)	
8	3/ 3	Review for Midterm Exam	Hmwk # 7 Due
	3/ 5	*** Midterm Exam ***	
### Spring Break ###			
9	3/17	Biological Effects of Radiation (10.1–10.6)	
	3/19	Radiation Protection (11.1–11.3)	
10	3/24	Criticality; Multiplication Factors (16.1–16.3)	Hmwk # 8 Due
	3/26	Four Factor Formula (16.4–16.8)	
11	3/31	Light Water Reactors (18.1–18.2, 18.4); Thermal Efficiency (17.4)	Hmwk # 9 Due
	4/ 2	Economics; Other Power Reactors (18.3, 18.5–18.9)	
12	4/ 7	Reactor Kinetics; Reactivity Feedback (20.1–20.3)	Hmwk # 10 Due
	4/ 9	Reactor Control; Fuel Burnup (20.4–20.7)	
13	4/14	Reactor Safety; PRA (21.1–21.5)	Hmwk # 11 Due
	4/16	TMI-2; Chernobyl; Fukushima (21.6–21.12)	
14	4/21	Nuclear Propulsion; Remote Power (22.1–22.5)	Hmwk # 12 Due
	4/23	Nuclear Fuel Cycle (23.1–23.5)	
15	4/28	Waste Disposal (23.6–23.10)	Hmwk # 13 Due
	4/30	Review for Final Exam	
16	5/ 5	*** Final Exam ***	

Discussion Board: Be sure to subscribe to the Community Forum discussion board as this is considered equivalent to in-class discussions. To ensure that your questions can be answered most effectively, be sure to state which homework set or lecture slide number that you are inquiring about.

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