

**United States Naval Academy
Mechanical Engineering Department**

Catalog Description: ER486A Nuclear Weapons Effects

Credit: 3 (3-0-3)

Designation: Elective, engineering sciences

Introduction to nuclear weapons with historical references, yield calculations, physics of assembly, fission, fusion, and disassembly. Prompt and residual effects, modeling, biological effects, and nuclear policy are covered.

Prerequisites: SP212 - General Physics II
SM212 - Differential Equations

Corequisites: None

Textbooks:

Required: *The Effects of Nuclear Weapons*, 3rd ed., S. Glasstone and P.J. Dolan, 1977.

Supplemental: *Swords of Armageddon, Volume I, The Development of U.S. Nuclear Weapons*, 2nd ed., C. Hansen, 2007.

Supplemental: *Introduction to the Physics of Nuclear Weapon Effects*, C. Bridgman, 2001.

Supplemental: *Handbook of Nuclear Weapon Effects*, J. Northrop, 1996.

Course Director: Asst. Prof. S.R. McHale

Course Content:

No.	Topic or Subtopic	hrs.
1	Energetics and design principles of fission and thermonuclear weapons	6
2	Prompt effects of nuclear weapons (X-rays)	4
3	Prompt effects (thermal radiation)	5
4	Prompt effects (air blast)	10
5	Prompt effects (underground and underwater shock propagation)	4
6	Prompt effects (electromagnetic pulse)	4
7	Dose to tissue and electronics from initial radiation field	5
8	Residual effects of nuclear weapons (fallout and biological response)	5
9	Nuclear policy	2

Assessment Methods:

		YES	NO
A	Quizzes	X	
B	Homework	X	
C	Exams	X	
D	Laboratory Reports		X
E	Oral Presentations	X	
F	Design Reports/Notebooks		X
G	Prototypes/Demonstrations	X	
H	Projects	X	
I	Other		X

Course Outcomes ¹ :

1. Apply physical concepts and principles to solve relevant problems related to the design, prompt, and residual effects of nuclear weapons
2. Comprehend empirical relationships and engineering tools used by the Department of Defense nuclear weapon effects communities
3. Develop computing tools to make approximate, quantitative estimates of at least one prompt or residual effect of nuclear detonations
4. Communicate effectively, both verbally and in writing, the critical examination and analysis of engineering problems
5. Demonstrate knowledge of contemporary nuclear issues

The tables below map the course learning objectives and requirements to the nuclear engineering program outcomes.

Course Outcome	Program Outcome										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
(1)	X				X		X		X	X	X
(2)	X				X	X		X	X	X	X
(3)	X				X						X
(4)	X				X		X			X	X
(5)						X	X	X	X	X	

Course Requirement	Program Outcome										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Problem Sets	X				X		X		X		X
Quizzes	X				X		X				X
Hour Exams	X				X		X				X
Projects	X				X	X	X	X	X	X	X
Final Exam	X				X		X	X	X	X	X

Date of Latest Revision: 16 NOV 2017, Asst. Prof. S.R. McHale