

**United States Naval Academy
Mechanical Engineering Department**

Catalog Description: EM320 Applied Thermodynamics

Credit: 3 (2-2-3)

Designation: Required, engineering sciences

Laboratory equipment which operates on principles of thermodynamics and fluid mechanics is used to reinforce analyses and design of gas and vapor power cycles, refrigeration and air conditioning, ship and aircraft propulsion systems, combustion, energy conversion and compressible flow.

Prerequisites: EM319-Engineering Thermodynamics or equivalent

Corequisites: None

Textbooks: Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey
Fundamentals of Engineering Thermodynamics, 8th Edition
John Wiley and Sons, Inc

Course Director: Professor Ralph J. Volino

Course Content:

No.	Topic or Subtopic	hrs.
1	Engineering Economics	2
2	Vapor Power Cycles	9
3	Gas Mixtures and Combustion	8
4	Gas Power Cycles	12
5	Compressible Flow	6
6	Refrigeration Cycles	6
7	Psychrometrics and Air Conditioning	9

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 Outcomes¹

1. Analyze and design steam power plants including systems with reheat and regeneration. (A,B,C,F)
2. Analyze gas power cycles including those applicable to gas turbine and internal combustion engines. (A,B,C,D,F)
3. Use compressible flow tables and relations to solve problems involving compressible flow in a nozzle. (A,B,C)
4. Analyze and design vapor and gas refrigeration systems. (A,B,C,D,F)
5. Use the psychrometric chart and computer software to compute properties in air-water vapor mixtures, and use this information for analysis and design of air conditioning systems. (A,B,C,F)
6. Write and balance chemical reactions and compute energy transfer associated with combustion problems. (A,B,C,D)
7. Evaluate, compute and report experimental uncertainty. (D)
8. Use computer software to perform parametric and optimization studies for the evaluation of thermodynamic designs. (F)
9. Use engineering economics to determine present and annual worth, and use these principles in the evaluation and comparison of engineering designs. (A,B,C,F)
10. Write technical reports to present designs and report experimental results. (D,F)

¹ Letters in parenthesis refer to the assessment methods listed in the previous section.

Program Outcomes	Course Outcomes									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(a)	X	X	X	X	X	X	X	X	X	X
(b)		X		X			X	X		X
(c)	X			X	X			X	X	X
(d)										
(e)	X	X	X	X	X	X				
(f)										
(g)										X
(h)	X								X	
(i)										
(j)	X				X					
(k)	X	X	X	X	X	X	X	X	X	X

Date of Latest Revision: 26 OCT 2017, Professor Ralph J. Volino