United States Naval Academy
Mechanical Engineering Department

EM300 Marine Propulsion Engineering

Catalog Description: EM300 Marine Propulsion Engineering **Credit:** 4 (3-2-4)

A study of naval engineering systems, including the principles of energy conversion and the basic operation of steam, gas turbine and internal combustion power plants.

Prerequisites: SP211 – General Physics I

Textbooks: Hawley, Wiggins, Vining and Lindler, "Thermodynamics of Marine Engineering Systems," 3rd Edition, Kendall / Hunt Publishing Company, *Required*

Course Director: Prof. K. W. Lindler

Objectives[1]:

1. To develop an understanding of the interaction of the principles of fluid dynamics and thermodynamics in various fluid flow and heat transfer applications. (a, b, c)
2. To present the capabilities, limitations, advantages and disadvantages of internal combustion, gas turbine and steam turbine propulsion plants. (a, b, c)
3. To apply the principles of thermodynamics to each component of propulsion plants as well as to the entire thermodynamic cycle. (a, b, c)
4. To demonstrate the fundamentals of refrigeration and air conditioning devices.(a, b, c)

Course Content:

No.	Topic or Subtopic	hrs.
1	Introduction	1
2	Fundamentals of Thermodynamics	16
3	Gas Power Cycles	10
4	Gas Turbines	15
5	Steam Properties and Steam Power Cycles	15
6	Refrigeration	5
7	Fluid Flow and Centrifugal Pumps	6
8	Heat Transfer	4
9	Electric Propulsion	1
10	Review	3
11	Laboratory Exercises	11

Evaluation:

1. Quizzes
2. Homework
3. Exams
4. Laboratory Reports

Acquired Abilities[2]:

1. Students will demonstrate the ability to apply the first law of thermodynamics to steady-state, steady flow processes, closed systems as well as thermodynamics cycles. (1, 2, 3, 4)
2. Students will demonstrate the ability to draw the T-s and P-v diagram and to calculate the heat transferred and work performed for each process of the Carnot, Otto, Diesel, Rankine, Brayton, Single Shaft Gas Turbine and Split Shaft Gas Turbine Cycle. (1, 2, 3, 4)
3. Students will demonstrate the ability to analyze a simple vapor compression refrigeration cycle. (1, 2, 3, 4)
4. Students will demonstrate the ability to apply Bernoulli's equation to determine the pressure drop and pumping requirements for various piping systems. (1, 2, 3, 4)
5. Students will demonstrate the ability to calculate the heat transferred in parallel flow and counter flow double pipe heat exchangers. (1, 2, 3, 4)

Date of Latest Revision: 5 Nov 2001

[1] Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering Program.
[2] Numbers in parenthesis refer to the evaluation methods used to assess student performance.