

**United States Naval Academy
Mechanical Engineering Department**

Catalog Description: EM474 Gas Turbines

Credit: 3 (2-2-3)

Designation: Elective, mechanical engineering major

A course designed to acquaint the student with the design and analysis of modern gas turbine engines currently employed by the U.S. Navy. The emphasis is on the constraints and limitations of the various components that comprise shaft power gas turbine engines such as axial and centrifugal compressors, combustors, axial and radial turbines, intercoolers, reheaters, regenerators and inlet/exit diffusers and nozzles. In addition, component matching and the problems associated with it will be studied. Also, future concepts in turbomachinery propulsion will be discussed. The course assumes a basic knowledge of thermodynamics and will add to the student's knowledge in such areas as compressible flow in turbomachinery, combustion analysis and emissions control. The culmination of the course is a final design project.

Prerequisites: EM319, EM320

Corequisites: None

Textbook: Course Notes provided by instructor

Course Director: Prof. Martin Cerza

Course Content:

No.	Topic or Subtopic	hrs.
1.	Introduction/Advanced Thermodynamic Concepts	5
2.	Thermodynamics of Gas Turbines	3
3.	Inlets/Combustors: Analysis and Design	4
4.	Axial Compressors: Analysis and Design	12
5.	Axial Turbines: Analysis and Design	12
6.	Centrifugal Compressors: Analysis and design	5
7.	Intercoolers/Recuperators	8
8.	Laboratory	8
9.	Miscellaneous	7

Assessment methods

		YES	NO
A	Quizzes		X
B	Homework	X	
C	Exams		X
D	Laboratory Reports	X	
E	Oral Presentations	X	

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F	Design Reports/Notebooks	X	
G	Prototypes/Demonstrations	X	
H	Projects	X	
I	Other		X

Course Outcomes¹

1. Familiarization and analysis ability of gas turbine engines and associated components used by the US Navy. *(B, F, H)*
2. In depth, familiarization of various gas turbine components. *(B, F, G, H)*
3. Familiarization with gas turbine diagnostics through laboratories. *(D, E, H)*
4. Ability to establish design criteria for specific gas turbine design tasks. *(E, F, G, H)*
5. Project skills, including presentation. *(E, F, G, H, I)*

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

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

Date of Latest Revision: 11 MAY 2010, Prof. Martin Cerza