COURSE NUMBER	**ME 312**
COURSE TITLE	**Thermodynamics II**
COURSE STRUCTURE	(3-0-3) (hrs/wk lecture – course credits)
COURSE COORDINATOR	H. V. Kountouras
COURSE DESCRIPTION	A continuation of ME 311 including studies of irreversibility and combustion. Thermodynamic principles are applied to the analysis of power generation, refrigeration, and air-conditioning systems. Introduction to solar energy thermal processes, nuclear power plants, and direct energy conversion.
PREREQUISITE(S)	ME311 – Thermodynamics I.
COREQUISITE(S)	None
REQUIRED, ELECTIVE, OR SELECTED ELECTIVE	Required
REQUIRED MATERIALS	Yunus A. Cengel and Michael A. Boles. THERMODYNAMICS: An Engineering Approach , 7th Edition, McGraw-Hill, NY, 2002, ISBN 978-0-07-352932-5
Other supplemental materials (not Required)	Yunus A. Cengel and Michael A. Boles. Property Tables Booklet/Thermodynamics, 6TH Edition, McGraw-Hill, NY, 2006, ISBN-13: 978-0073277127
COMPUTER USAGE	None
COURSE LEARNING OUTCOMES/ EXPECTED PERFORMANCE CRITERIA:	

Course Learning Outcomes	SOs*	Expected Performance Criteria
1. **Apply** the principles of thermodynamics to the optimal design of the basic energy conversion systems: power generation, refrigeration, air-conditioning, and combustion.	a, b, c, d, e, g, k	**Design Project** (80% of students will earn a grade of 75% or better on the project)
2. **Use** thermodynamic relations and the property tables and charts for the analysis of energy conversion systems in the course of their operation.	a, e, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question)
3. **Analyze**, evaluate performance, and solve problems in gas, steam and refrigeration cycles (Otto, Diesel, Brayton, Rankine, Carnot, vapor-compression refrigeration … etc,).	a, e, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question)

	4. **Discuss** the social, economic, political, ethical and environmental issues associated with power generation in the world.	f, g, h, i, j	**Report** (80% of students will earn a grade of 75% or better on this report)
	5**. Describe** compositions of gas mixtures and determine the mixture properties to ideal and real gas mixtures as well as predict the behavior of the mixture based on Dalton's and Amagat's law.	a, e, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question)
	6. **Apply** the principles of the conservation of mass and energy to various air-conditioning processes of atmospheric air.	a, e, j, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question)
	7. **Apply** conservation of mass and energy to fuel in the combustion of reacting systems.	a, e, j, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question)
	8. **Develop** the general relations for compressible flows and concepts of stagnation state, Mach number, isentropic flows as well as effect of area changes on supersonic and subsonic flows.	a, e, k	**Exam Question** (80% of students will earn a grade of 75% or better on this question.
	9. **Apply** the first and the second laws of thermodynamics to the optimization of the basic energy conversion systems	a, b, c, d, e, g, k	**Design Project** (80% of the students will earn a grade of 75% or better on the project)

CLASS TOPICS

1. Gas Power Cycles.
2. Vapor Power Cycles.
3. Refrigeration Cycles.
4. Gas Mixtures.
5. Gas-vapor Mixtures and Air-conditioning.
6. Chemical Reactions.
7. Thermodynamics of High-speed Gas Flow.
8. Review.

STUDENT OUTCOMES (SCALE: 1-3)

a	b	c	d	e	f	g	h	i	j	k
3	2	2	2	3	2	3	2	2	2	2

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes