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, direct energy conversion and simple compressible flow.
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 , 8th Edition, McGraw-Hill, NY, 2016, ISBN 978-0-07-352932-5
Other supplemental materials (not Required)	Yunus A. Cengel and Michael A. Boles. Property Tables Booklet/Thermodynamics, 8TH Edition, McGraw-Hill, NY, 2015, ISBN-13: 978-0073277127
COMPUTER USAGE	Mathcad/C++/Word/Excel in Final Project
COURSE LEARNING OUTCOMES/EXPECTED PERFORMANCE CRITERIA:	

Course Learning Outcomes: Upon completing this course, students will be able to:	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.	1,2,3,	**Deign Project** (80% of students will earn a grade of 70% 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.	1	**Exam Question** (80% of students will earn a grade of 70% or better on this question)
3. **Analyze**, evaluate performance, and solve problems in gas, steam and refrigeration cycles (Otto, Diesel, Brayton, Rankine, Carnot,	1	**Exam Question** (80% of students will earn a grade of 70% or better on this question)

	vapor-compression refrigeration etc,).		
	4. **Discuss** the social, economic, political, ethical and environmental issues associated with power generation in the world.	3,7	**Report** (80% of students will earn a grade of 70% 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.	1	**Exam Question** (80% of students will earn a grade of 70% or better on this question)
	6. **Apply** the principles of the conservation of mass and energy to various air-conditioning processes of atmospheric air.	1,3	**Exam Question** (80% of students will earn a grade of 70% or better on this question)
	7. **Apply** conservation of mass and energy to fuel in the combustion of reacting systems.	1,3	**Exam Question** (80% of students will earn a grade of 70% 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.	1	**Exam Question** (80% of students will earn a grade of 70% or better on this question.
	9. **Apply** the first and the second laws of thermodynamics to the optimization of the basic energy conversion systems	1,2,3,5	**Design Project** (80% of the students will earn a grade of 70% or better on the project)

CLASS TOPICS

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

STUDENT OUTCOMES

(SCALE: 1-3)

1	**2**	**3**	**4**	**5**	**6**	**7**
3	2	2		3		3

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes