MENG 244 – Fundamentals of Thermodynamics

Department:
Mechanical Engineering

Program Name: Mechanical Engineering	**Program Code:** 23	
Course Code: MENG244	**Credits:** 3 Cr	**Year/Semester:** 2016-2017/Spring

☐ Required Course ☐ Elective Course ☒ Service Course

Prerequisite(s):
-

Catalog Description:
Basic concepts and definitions of thermodynamics. Properties of pure substances. The first law of thermodynamics for the closed and open systems. The second law of thermodynamics. Entropy as a property. Brayton cycle (gas power cycle). Rankine cycle (steam power cycle). Refrigeration cycles.

Course Web Page:
me.emu.edu.tr/aydin

Textbook(s):
Cengel and Boles, Thermodynamics: An Engineering Approach, McGraw-Hill, 8th Edition 2015
Lab Manual:
Lab manuals will be posted to the web.

Indicative Basic Reading List :
There are many books in the library

Topics Covered and Class Schedule:
(3 hours of lectures + 1 hour of lab or tutorial per week)

Week 1	**Introduction and Basic Concepts:** Basic concept of thermodynamics, Definition of the terms, Dimensions and units, forms of energy, pressure, and temperature.
Week 2 and Week 3	**Energy, Energy Transfer and General Energy Analysis:** Forms of energy, energy transfer by heat, energy transfer by work, First Law of Thermodynamics, energy conversion efficiencies.
Week 4 and Week 5	**Properties of Pure Substances:** Pure substance, phase change, property diagrams and property tables, ideal gas equation of state, compressibility factor.
Week 6	**Energy Analysis of Closed Systems:** Moving boundary work, energy balance for closed systems, specific heats, internal energy and enthalpy.
Week 7 and Week 8	**Mid-Term Examination**
Weeks 9 and Week 10	**Mass and Energy Analysis of Control Volumes:** Conservation of mass, flow work and the energy of a flowing fluid, energy analysis of steady flow systems, steady flow engineering devices, energy analysis of unsteady flow processes.
Week 11	**The Second Law of Thermodynamics:** Introduction to the second law, thermal energy reservoirs, heat engines, refrigerators and heat pumps, reversible and irreversible processes, the Carnot Cycle, the Carnot Heat Engine, The Carnot Refrigerator and Heat Pump
Weeks 12	**Entropy: A Measure of Disorder:** The increase of entropy principle, entropy change of pure substances, property diagrams involving entropy.
Week 13	**Gas Power Cycles:** Bryton Cycle, Bryton Cycle with Regeneration,
Week 14	**Vapor, Combined and Refrigeration Cycles:** Rankine Cycle, ideal reheat Rankine Cycle, ideal regenerative Rankine Cycle, cogeneration, ideal vapor-compression refrigeration cycle.
Week 15:	**Final Examination**

	Laboratory Schedule: **(2 hours of laboratory per week)**
Week 6	Measuring The Absoloute Zero Temperature
Week 10	The Heat Engine

Course Learning Outcomes:

At the end of the course, student must be able to

1- Understand basic concepts of thermodynamics and terms of thermodynamics.
2- Understand the concept of "System".
3- Understand energy and energy transfer.
4- Comprehend energy analysis of a system.
5- Understand how to find the properties of pure substances.
6- Comprehend the energy analysis of a closed system.
7- Comprehend mass and energy analysis of open system.
8- Understandin the 2nd Law of Thermodynamics.
9- Understand heat engine, refrigerator, and heat pump.
10- Understand the cycle for Gas-Turbine and Vapor Cycle

	Method	**No**	**Percentage**
Assessment	Midterm Exam	1	30%
	Quizzes	2	15 %
	Lab Report (s)	2	15 %
	Final Examination	1	40 %

Contribution of Course to Criterion 5
Credit Hours for:

Mathematics & Basic Science : 0
Engineering Sciences and Design : 3
General Education : 0

Relationship of Course to Program Outcomes
The course has been designed to contribute to the following program outcomes:

(a) apply knowledge of mathematics, science, and engineering
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(e) identify, formulate, and solve engineering problems

Prepared by: Asst. Prof. Dr. Devrim Aydin	**Date Prepared: 18th Feb 2017**

NG Policy:
Students who do not attend both mid-term and final exams will be given NG.