MENG246 – Thermodynamics-II

Eastern Mediterranean University
Faculty of Engineering

Department:
Mechanical Engineering

Program: Mechanical Engineering	**Program Code:** 23	**Year/Semester:** 2019-2020 FALL			
Course Code: MENG246	**Course Title:** Thermodynamics-II	**Credit hours**			
		Lec.	**Tut**	**Lab/Activity**	**Total**
		3	**1**	**1**	**3**

Criterion 5
Subject Area:

☐ (a) College-level mathematics and basic sciences with experimental experience appropriate to the program.
☒ (b) Engineering topics appropriate to the program, consisting of engineering and computer sciences and engineering design, and utilizing modern engineering tools.
☐ (c) a broad education component that complements the technical content of the curriculum and is consistent with the program educational objectives.
☐ (d) a culminating major engineering design experience that
- ☐ 1) Incorporates appropriate engineering standards and multiple constraints
- ☐ 2) Based on the knowledge and skills acquired in earlier course work.

Hourly Contribution
☐ Basic Science ()
☐ College-level Mathematics ()
☐ Complex Engineering Problems ()
☐ Engineering Design ()
☐ Engineering Science (3)
☐ Team ()

Type of Course
☒ Engineering or Area Core
☐ Engineering Course offered by other programs
☐ Engineering or Area Elective
☐ Mathematics and Basic Sciences
☐ General Education

Prerequisite(s): MENG245 Thermodynamics I, MENG203 Experimental Methods for Engineers

Catalog Description:
Gas power cycles. Vapor and combined power cycles. Refrigeration cycles. Thermodynamic property relations. Gas mixtures. Gas-vapor mixtures and air conditioning. Chemical reactions. Chemical and phase equilibrium. Thermodynamics of high speed fluid flow.

Course Web Page: https://staff.emu.edu.tr/muratozdenefe/en/teaching/meng246

Textbook(s): Çengel, Y. A. and Boles, M. A., Thermodynamics: an Engineering Approach, 8th ed., The McGraw-Hill Companies, New York, 2015.

Topics Covered and Class Schedule:	
Week 1 & week 2	**Gas Power Cycles:** The Carnot cycle and its value in engineering, air standard assumptions, Otto cycle, Diesel cycle, Stirling and Ericsson cycles, Bryton cycle, ideal jet-propulsion cycles, second law analysis of gas power cycles.
Week 3 & week 4	**Vapor and Combined Power Cycles:** The Carnot vapor cycle, Rankine cycle, regenerative and reheat Rankine cycles, second-law analysis of vapor power cycles, cogeneration, combined gas-vapor cycles.
Week 5 & week 6	**Refrigeration Cycles:** The reversed Carnot cycle, ideal vapor-compression refrigeration cycle, second-law analysis of vapor-compression refrigeration cycle, heat pump systems, gas refrigeration cycles, absorption refrigeration systems.
Week 7	**Gas mixtures:** Mass and mole fractions, P-v-T behavior of gas mixtures, properties of gas mixtures.
Week 8 & week 9	**Midterm Examination Week**
Week 10 & week 11	**Gas-vapor mixtures and air-conditioning:** Dry and atmospheric air, specific and relative humidity of air, dew point temperature, adiabatic saturation and wet-bulb temperatures, Psychrometric chart, human comfort, air-conditioning.
Week 12 & week 13	**Chemical reactions:** Fuels and combustion, theoretical and actual combustion, enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, entropy change of reacting systems, second-law analysis of reacting systems.
Week 14	**Chemical and phase equilibrium:** Criterion for chemical equilibrium, equilibrium constant for ideal gas mixtures, chemical equilibrium for simultaneous reactions, variation of Kp with temperature, phase equilibrium. **Compressible flow:** Stagnation properties, speed of sound and Mach-number, 1D isentropic flow, isentropic flow through nozzles, shock waves and expansion waves, duct flow with heat transfer, steam nozzles
Week 15	**Final Examination Week Starts**

Lecture and Tutorial Outcomes	**Student Outcomes**	**Performed Assessments and Percentage**
• Apply principles of math, science and engineering in solving Thermodynamics II problems. • An ability to identify, formulate, and solve engineering problems. • Identify ways in which knowledge of thermodynamics aids in the design of energy systems for improved efficiency and reduced pollution. • Demonstrate effective use of the internet to find examples of devices related to energy production.	**(1)** An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics **(4)** An ability to recognize ethical and professional	Midterm➔30% Final➔40% Quiz 1➔5% Quiz 2➔5%

• Write an essay on the selection of a power cycle and its contribution to global warming; solve typical Thermodynamics II problems using EES software.	responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts **(7)** An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Lab. Experiment Title and Lab. Equipment Used	**Lab Learning Outcome**	**Student Outcomes**	**Performed Assessments and Percentage**
Exp. title: Wet cooling tower **Equipment:** Hilton water cooling tower	Comprehend the energy and mass balance as well as heat and mass transfer in a wet cooling tower by appropriately setting the experimental rig and running the experiment successfully.	**(6)** An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Lab.1 Report➔10%
Exp. title: A/C unit experiment **Equipment:** Hilton air conditioning laboratory unit	Understand the basic principles of thermodynamics of the air conditioning by appropriately setting the experimental rig and running the experiment successfully.	**(6)** An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Lab.2 Report➔10%

Important Notes Regarding the Course: University rules and regulations are applied to this course.

Lab. Dates:
1st Lab: Week 11➔ 2-6 December 2019
2nd Lab: Week 13➔ 16-20 December 2019

Quiz Dates:
1st Quiz: During 3rd lecture hour of week 4➔ 16 October, Wednesday at 14:30
2nd Quiz: During 3rd lecture hour of week 12➔ 11 December, Wednesday at 14:30

NG Policy:
Students,

- who do not attend both mid-term and final exams or
- who do not fulfill the lab requirements (attendance and report submission) or
- who have less than 60 % lecture attendance and fail (D- or F)

will be given NG.

Appeals:
Any appeal against the marks of any assessment component must be made to the course instructor within one week following the announcement of the marks.
Any appeal concerning a semester grade must be made to the course instructor no later than the end of the registration period of the following semester.

Makeups:
There will be no make up for quizzes or labs.
A student who fails to sit for an examination for a valid reason is given a make-up exam. Within three working days after the examination, students who wish to take a make-up must submit a written statement to the course instructor explaining the reason(s) for his/her request.
The student also must fill in the makeup examination form (available at the course website) and submit to the course instructor within three working days after the examination.