MENG246 Thermodynamics II

Eastern Mediterranean University
Faculty of Engineering

Department:
Mechanical Engineering

Program Name: Mechanical Engineering	**Program Code:** 23

Course Code:	**Course Title:**	**Credits:**	**Year/Semester:**
MENG246	Thermodynamics II	3 Cr	2017-2018 Spring

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

Prerequisite(s): MENG245 & MENG203

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.

Instructor Name:	**Office no:**	**Office Tel:**
Asst. Prof. Dr. Devrim Aydın	ME120	6301045

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

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

Indicative Basic Reading List : Adrian Bejan, Advanced Engineering Thermodynamics, Wiley, 3rd edition, 2006.

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

Week 1 and 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 and 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 and 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 and week 8	**Gas mixtures :** Mass and mole fractions, P-v-T behavior of gas mixtures, properties of gas mixtures
Week 9 and week 10	**Midterm Examination Week**
Week 11 and week 12	**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
Weeks 13 and week 14	**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 15	**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
Week 15	**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 16	**Final Examination Week Starts**

Lecture and Tutorial Learning Outcome	Student Outcomes	Performed Assessments and Percentage
• apply principles of math, science and engineering in solving Thermodynamics II problems; • design a thermodynamic cycle or process; • demonstrate ability to function in design teams; • an ability to identify, formulate, and solve engineering problems. • identify ethical issues associated with engineering solutions to the selection of a particular power cycle for a given application; • demonstrate effective solution procedures to communicate solutions to 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; • write an essay on the selection of a power cycle and its contribution to global warming; solve typical Thermodynamics II problems using EES software;	**a, e, h, k**	Midterm (1) 30% Final Exam (1) 40% Quizzes (2) 10%

Lab. Experiment Title and Lab. Equipment Used	Lab Learning Outcome	Student Outcomes	Performed Assessments and Percentage
1. Cooling tower experiment	ability to design and conduct experiments, as well as analyze and interpret data	**b**	Laboratory 10%
2. A/C unit experiment	ability to design and conduct experiments, as well as analyze and interpret data	**b**	Laboratory 10%

Contribution of Course to Criterion 5

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

Important Notes:

Quiz Dates:

Quiz 1: During tutorial hour of week 4➔ 9th March 2018, Friday at 11:30
Quiz 2: During tutorial hour of week 13➔ 11th May 2018, Friday at 11:30

Lab Dates:

Lab 1: Week 11➔ 24th - 27th April 2018,
Lab 2: Week 12➔ 2nd - 4th May 2018,

NG Policy:

Students,

- who do not attend both mid-term and final exams or
- who do not attend lab1 and lab2 or
- who have less than 60 % lecture attendance and fail

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.