OSTIM TECHNICAL UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

COURSE SYLLABUS 2020-2021

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MS Teams Link:
https://teams.microsoft.com/l/meetup-join/19%3aada8f26074c3456da8811759ff20ec66%40thread.tacv2/1602071938736?context=%7b%22Tid%22%3a%223045aa6c-0097-4a07-b6fb-f76517621c19%22%2c%22Oid%22%3a%2259db7b85-3b38-4e39-9a01-853667aa9bbf%22%7d

THERMODYNAMICS I MEC 205							
Course Name	**Course Code**	**Period**	**Hours**	**Application**	**Laboratory**	**Credit**	**ECTS**
THERMODYNAMICS I	MEC 205	1	3	0	0	3	4

Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Discussion, Question/Answer, Short Quizzes, Assignments
Day and time of lectures	Wednesday, 15:00-16:45 Lecture Wednesday, 17:00-17:45 Problem solving **Note**: Students will not be admitted to the virtual classroom if they are late for more than 5 minutes.

Course Objective

The objective of this course is to gain a general understanding of energy, energy interactions and energy conversion processes, and to analyze and solve related real world engineering problems by applying the 1st and 2nd laws of thermodynamics.

Learning Outcomes

1. Learning the basic concepts of thermodynamics and the properties of substances using property tables or property relations.
2. Understanding the different forms of energy, energy interactions by heat and work transfer, and the 1st law of thermodynamics.
3. Solving real world engineering problems related to energy by applying the 1st law thermodynamics to closed and open systems like piston-cylinder devices, turbines, heat exchangers, and charging/discharging processes.
4. Understanding the 2nd law of thermodynamics and quantifying the performance of heat engines, heat pumps and refrigerators, reversible and irreversible processes, and

second-law efficiency
5. Defining entropy, developing entropy change relations, and deriving the increase of entropy principle,
6. Performing 2nd law analysis of engineering processes by quantifying entropy generation.
7. Analyzing some basic thermodynamics cycles like the Otto, Diesel, Brayton cycles for power production and the vapor compression refrigeration cycle for cooling applications.

Course Outline
Basic concepts and definitions, properties of a pure substance, equations of state, work and heat interactions, first law of thermodynamics, internal energy and enthalpy, second law of thermodynamics, entropy, reversible and irreversible processes, thermodynamic analysis of processes, third law of thermodynamics.

Weekly Topics and Releated Preparation Studies

Weeks	Topics	Preparation Studies
1	Introduction and Basic Concept	Chapter 1
2	Energy and General Energy Analysis	Chapter 2
3	Energy and General Energy Analysis **Quiz #1** Chapter 2 Energy and General Energy Analysis	Chapter 2
4	Properties of Pure Substances	Chapter 3
5	First Law for Closed Systems Quiz #2 Chapter 4 First Law for Closed Systems	Chapter 4
6	First Law for Closed Systems	Chapter 4
7	First Law for Control Volumes **Quiz #3** Chapter 5 First Law for Control Volumes	Chapter 5
8	First Law for Control Volumes	Chapter 5

9	Second Law of Thermodynamics **Quiz #4** Chapter 6 Second Law of Thermodynamics	Chapter 6
10	Second Law of Thermodynamics	Chapter 6
11	Entropy **Quiz #5** Chapter 7 Entropy	Chapter 7
12	Entropy	Chapter 7
13	Entropy **Quiz #6** Chapter 7 Entropy	Chapter 7
14	Exergy	Chapter 8
15	Exergy	Chapter 8
16	**Final Exam**	

Textbook/Supplementary Materials:
The following textbook as eBook is mandatory, and must be purchased by each student. All quizzes and the final exam will be open book: **Thermodynamics: An Engineering Approach, 9**th ed in SI Units Yunus A. Çengel, Michael A. Boles, M. Kanoğlu, McGraw-Hill Education. Purchase the code from (it is 185 TL): http://www.caglayan.com/urundetay/634782/KOD-Thermodynamics-SI-9e-Cengel-OZU1447077701#sthash.HcfO1buP.dpbs Click the following link and enter the code that you purchased to access the eBook: https://connect.mheducation.com/class/y-cengel-fall-2020 (Students can also purchase the eBook and the print book or just the print book; but they are more expensive. The recommended eBook is the most economical). Note: The lectures will be recorded and the students will have free access to all recorded lectures.

Assessment		
Studies	**Number**	**Percentage (%)**
Attendance (Required)		Minimum 80%
Lab		Minimum 80%
Application		
Field Study		
Course-Specific Internship (if any)		
Grading:		**% Grade:**
Quizzes	6	50%
Homeworks & Projects		10%
Presentation		

Report		
Midterm Exams / Midterm Jury		
Final Exam	1	40%
Total		**100%**

Relationship Between Course Learning Outcomes and Program Competencies							
Nu	**Learning Outcomes**	**Contribution Level**					
		1	**2**	**3**	**4**	**5**
1	An ability to apply knowledge of science, mathematics, and engineering.				x	
2	An ability to design energy systems, components, or processes to meet industrial needs.		X			
3	An ability to work with multi-disciplinary teams.		X			
4	An ability to identify, formulate, and solve engineering problems.				X	
5	Take responsibility to solve unpredictable and complex problems encountered in applications.				X	
6	plan and manage activities in teamwork		X			
7	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.				x	
8	Can do research on interdisciplinary fields.		X			

ECTS / Workload Table			
Activities	**Number**	**Duration (Hours)**	**Total Workload**
Course hours (Including the exam week: 16 x total course hours)	16	3	48
Laboratory			
Application			
Course-Specific Internship			
Field Study			
Study Time Out of Class	14	4	56
Presentation / Seminar Preparation			
Projects			
Reports			
Homeworks	5	6	30
Quizzes / Studio Review	6	2	12
Preparation Time for Midterm Exams / Midterm Jury	2	15	30
Preparation Period for the Final Exam / General Jury	1	15	15
Total Workload			**191**

Links of some video content:

Chapter 02
Internal Energy i
Internal Energy ii
Internal Energy iii
Heat vs. Temperature

Chapter 03
Heating a Pure Substance
How Does a Steam Turbine Work

Chapter 04
Heating a Pure Substance

Chapter 05
Enthalpy and Flow of Work
Throttle Mixing Chambers

Chapter 06
Reversible vs. Irreversible Processes
Sources of Irreversibilities
Carnot Engine
Quality of Energy

Chapter 07
Entropy i
Entropy ii
Entropy iii
Entropy Balance and Generation
Compressor Work and Isentropic Efficiencies
Entropy Balance and Generation

Chapter 08
Exergy and Control Volumes with Steam