The University of Jordan
School of Engineering

Department	Course Name	Course Number	Semester
Mechanical Engineering	Thermodynamics I	0904341	

2019 Course Catalog Description

Thermodynamic concepts and definitions, states, properties, systems, control volume, processes, cycles, and units, pure substances, equation of states, table of properties, work and heat, the first law, internal energy and enthalpy, conservation of mass, SSSF and USUF processes, the second law, heat engines and refrigerators, reversible processes, Carnot cycle, entropy, Clausius inequality, principle of the increase of entropy, Efficiencies.

Instructors

Name	E-mail	Sec	Office Hours		Lecture Time	
			Su, Tu, Th		Su, Tu, Th	

Text Books

	Text book 1	Text book 2
Title	Thermodynamics /An Engineering Approach	
Author(s)	Y. Cengel and M. Boles,	
Publisher, Year, Edition	McGraw-Hill, 2022, 10^{th}. or 9^{th}.edition, SI units	

References

Books	1. Fundamentals of Thermodynamics, R. Sonntag, C. Borgnakke, and G. Van Wylen, sixth edition, 2003, (or latest), John Wiley and Sons, Inc. USA. 2. Fundamentals of Engineering Thermodynamics, H. Shapiro and M. Moran, Fifth edition, 2004, (or latest), John Wiley and Sons, Inc. USA.
Journals	
Internet links	

Prerequisites

Prerequisites by topic	1. Differentiation and integration. 2. Work and Heat. 3. Concepts of velocity, acceleration, force and energy. 4. 4. Newton's laws of motion.
Prerequisites by course	General Physics (2) 0302102
Co-requisites by course	
Prerequisite for	1. Thermodynamics (2) 2. Thermodynamics Lab.

Topics Covered

Week	Topics	Chapter in Text	Sections
1	Introduction and Basic Concepts	Chapters 1	1-1 ,1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-11
2	Energy, Energy Transfer, and Energy Analysis	Chapters 2	2-2, 2- 3, 2-6, 2-7, 2.8.
3-5	Properties of Pure Substances	Chapters 3	3-2, 3-3, 3-4, 3-5, 3-6, 3.7, 3.8.
6-7	Energy Analysis of Closed Systems	Chapters 4	4-1, 4-2, 4-3, 4-4, 4-5.
8-10	Mass and Energy Analysis of Control Volumes	Chapters 5	5-1, 5-2, 5-3, 5-4, 5-5.
11-12	The 2^{nd}. Law of Thermodynamics	Chapters 6	6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8, 6-9, 6-10, 6-11.

13-15	Entropy	Chapters 7	7-1, 7-2, 7-3, 7-7, 7-9, 7-10, 7-11, 7-12, 7-13.

Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
1	1. Ability to recognize closed and open, steady and non-steady systems, properties and states of ideal gases. 2. Ability to solve pressure and manometry problems. 3. Apply 1st law of thermodynamics in its various forms to calculate energy, work and heat transfer, and apply energy conversion efficiencies for various systems. 4. Ability to calculate various properties of pure substance and ideal gas, applying that in the equation of state, and various processes. 5. Ability to analyze mass and energy changes of systems and control volumes for steady and non-steady systems. 6. Ability to calculate entropy changes for pure substance in various processes and calculating work and heat in those processes. 7. Ability to use 1st and 2nd law analysis for the calculation of reversible work and irreversibility. 8. Ability to apply 1st law analysis on heat engines, refrigerators and heat pumps. 9. Ability to apply 2nd law analysis on heat engines, refrigerators and heat pumps, and evaluate 2nd law efficiency.

Evaluation

Assessment Tools	Expected Due Date	Weight
First Exam	To be announced	50 %
Second Exam	To be announced	
Final Exam	To be announced	50 %

Contribution of Course to Meet the Professional Components

Building the fundamental basic concepts of thermodynamics and provides an ability to solve common engineering problems, including problems involving heat engines, refrigeration machines and heat pumps.

Relationship to Student Outcomes

SOs	1	2	3	4	5	6	7
Availability	X						

ABET Student Outcomes (SOs)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated by ABET Committee, Jan. 2024