

**Faculty of Engineering & Technology**

**Engineering Thermodynamics**

**Information :**

**Course Code :** MPR 251

**Level :** Undergraduate

**Course Hours :** 4.00- Hours

**Department :** Department of Mechanical Engineering

**Instructor Information :**

Title	Name	Office hours
Professor	Mahmoud Abdelrasheed Nosier Touny	8
Lecturer	Anas Mohamed Abdelrahman Ali	6
Assistant Lecturer	Moustafa Raafat Aziz Shousha	3
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**Area Of Study :**

The Main Goals of this course are:

- Enrich students' knowledge about thermodynamics.
- Train students to apply the fundamental principles of thermodynamics.
- Allow students to explore the fundamental principles of thermodynamics through experimentation.
- Develop students' skills for analyzing experimental data and working in teams.

**Description :**

Introduction, Fields of application, Fundamental concepts and definitions, Thermo-dynamics Systems; System Classification, Properties and State Processes and Cycles, Properties of a Pure substance; Vapor - Liquid - Solid - Phases of Pure substance, Ide-al gas relations, Work and Heat; definitions, kinds of work, heat transfer modes, The first law of thermodynamics; closed system analysis, Control - Volume analysis and applications, Transient process analysis, The second law of Thermodynamics; Heat Engines and Refrigerators, Carnot cycle, Reversed Carnot cycle, Entropy, Irreversibility and availability, Mixtures of gases.

**Course outcomes :**

**a.Knowledge and Understanding: :**

1 -	Identify basic applied and engineering science related to thermodynamics.
2 -	Define new terms in thermodynamics.
3 -	List different types of energies found in nature.
4 -	Distinguishes between ideal and real gases.
5 -	Demonstrate different methods to obtain the thermodynamic properties for different substances and phases.
6 -	Define the zeroth, first and second laws of thermodynamics.
7 -	Identify applications related to thermodynamics, considering the constraints which mechanical engineers have to judge to reach an optimum operation.

**b.Intellectual Skills: :**

1 -	Deduce the equations of the first, second laws of thermodynamics.
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2 -	Solve different engineering problems related to thermodynamics.
3 -	Analyse different engineering systems using thermodynamics principles.
4 -	Relate the energy efficiency ratio of a given system to Carnot efficiency.
<b>c. Professional and Practical Skills: :</b>	
1 -	Practice basic experiments related to thermodynamics.
2 -	Follow up safety requirements at experimental work and observe the appropriate steps to manage risks.
3 -	Analyse experimental results.
4 -	Write a technical report on a project or an assignment.
<b>d. General and Transferable Skills: :</b>	
1 -	Collaborate effectively within multidisciplinary team in preparing researches in heat transfer.
2 -	Refer to relevant literature.

### **Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Property and state, processes and cycles.	6	3	3
Definition of work and heat transfer.	9	6	3
Ideal gases; state equation; specific heat at constant pressure and volume.	6	3	3
Pure substances and phase equilibrium.	6	3	3
Tables of thermodynamic properties.	6	3	3
First law of thermodynamics; closed and open systems.	6	3	3
Applications of first law of thermodynamics.	6	3	3
Transient system analysis.	9	6	3
Second law of thermodynamics.	9	6	3
Basic concepts and definitions; system types.	6	3	3
Entropy.	12	6	6

### **Teaching And Learning Methodologies :**

Interactive lecture
Discussion
Problem-based learning
Laboratory experiments
Research activity

### **Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	5.00		
Final Exam	40.00	15	
Lab. Experiments	5.00		

Mid- Exam 1I	15.00	11	
Mid- Exam I	15.00	6	
Oral Exam	5.00		
Participation	10.00		
Quizzes	5.00		

**Recommended books :**

- 1) Fundamentals of Thermodynamics, Richard E. Sonntag, Claus Borgnakke, and Gordon J. Van Wylen , John Wiley & Sons, Inc., 2003
- 2) Applied Thermodynamics for Engineering Technologists, T.D. Eastop and A.McConkey, Longman Group, Ltd. 1998