

Engineering Thermodynamics

Code AE-208	Credit Hours 3-1
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Course Description:

This is the first course in Engineering Thermodynamics that covers topics on energy, its transfer, transformations, and related processes by adopting macroscopic approach. Based on energy in the form of heat, work and mass transfer, laws of thermodynamics and their applications are discussed.

Text Book:

1. "Thermodynamics: An Engineering Approach, Latest Available Edition By Yunus Cengel and Michael Boles
2. Physics by Aviation Maintenance Technician Certification Series, Latest Available Edition
3. Piston Engine by Aviation Maintenance Technician Certification Series, Latest Available Edition

Reference Book:

1. "Fundamentals of Engineering Thermodynamics," Moran Michael J., John Wiley Inc.

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10-15%
Assignments	5-10%
Mid Terms	30-40%
ESE	40-50%

ASSESSMENT SYSTEM FOR LAB:

Quizzes	10%-15%
Assignments	5% - 10%
Lab Work and Report	70-80%
Lab ESE/Viva	20-30%

Teaching Plan

Week No	Topics	Learning Outcomes
1-2	Introduction and Basic Concepts	<ul style="list-style-type: none"> Course Outline, objectives, teaching plan, assessment method, concepts review Systems and Control volumes, system properties State and equilibrium, processes & cycles Temperature and Zeroth Law of

		Thermodynamics <ul style="list-style-type: none"> • Pressure and its measurement
3	Energy, Energy Transfer, and General Energy Analysis	<ul style="list-style-type: none"> • Forms of Energy • Energy transfer by heat • Energy transfer by work • Mechanical forms of work • First Law of Thermodynamics
4-5	Properties of Pure Substance	<ul style="list-style-type: none"> • Pure substance and its phases • Phase change processes of pure substances • Property diagrams of phase change processes • Property Tables • Ideal Gas equation of state
6	Energy Analysis of Closed Systems	<ul style="list-style-type: none"> • Moving boundary work • Energy balance for closed system
7	Energy Analysis of Closed Systems	<ul style="list-style-type: none"> • Specific heats • Internal energy, enthalpy, and specific heats of Ideal Gases
8	Mass and Energy analysis of Control Volumes	<ul style="list-style-type: none"> • Conservation of mass • Flow work and Energy of flowing fluid • Some steady flow Engineering Devices
9	MID TERM EXAM	
10-12	Second law of Thermodynamics	<ul style="list-style-type: none"> • Introduction to Second Law • Heat Engines • Refrigerators and Heat Pumps • Reversible and irreversible processes • Carnot Cycle • Carnot Principles • Carnot Heat Engine • Carnot Refrigerator and Heat Pump
14-17	Entropy	<ul style="list-style-type: none"> • Internally reversible heat transfer process • Increase of Entropy Principle • Entropy change of Pure Substance Isentropic process • Property diagrams involving Entropy • The Tds Relations • Entropy change of Liquid and Solids • Entropy change of Ideal Gases • Reversible Steady Flow Work • Isentropic Efficiencies of Steady Flow Devices • Introduction to Exergy
18	END SEMESTER EXAM	

LAB PART

Lab NO	Lab Equipment	List of Experiments
1	Lab Visit – Briefing on Lab Equipment and General Safety Precautions	
2-3	Pressure Investigation Unit	<p>Experiment 1 Different methods and applications of pressure measurement.</p> <p>Experiment 2 To determine the pressure measured with different pressure measuring devices and to compare the measured values in U-Tube manometer.</p>
4	Marcet Boiler	<p>Experiment 3 Relationship of Temperature and Vapor Pressure.</p>
5-7	Temperature Measurement bench	<p>Experiment 4 • Temperature Measurement Methods</p> <p>Experiment 5 The Seebeck Thermo Electric Effect</p> <p>Experiment 6 The Peltier Thermo-Electric Effect</p>
8-9	Mechanical Heat Pump	<p>Experiment 7 • Determination of power input, heat output and coefficient of performance of a vapor compression heat pump system.</p> <p>Experiment 8 • Production of heat pump performance curves over a range of source and delivery temperatures.</p>
10-11	Steam Power Plant with Steam Engine	<p>Experiment 9 Demonstration of the function of the steam engine.</p> <p>Experiment 10 Observing the steam and plotting steam pressure curve.</p>
12	Bomb Calorimeter	<p>Experiment 11 Determination of enthalpy of combustion.</p>
13	Single Stage Air Compressor Apparatus	<p>Experiment 12 Isothermal and Volumetric Efficiency</p>
14	Spark ignition engine, 4 cylinders in line, 4-strokes Cut Model	<p>Experiment 13 Demonstration only</p>
15	Spark ignition engine, Single cylinder engine Cut Model	<p>Experiment 14 Demonstration only</p>
16	Lab End Term	