Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Erbil Technology College	
Department	Automotive Technology Engineering	
Module Name	Thermodynamics	
Module Code	THE506	
Degree	Technical Diploma [ ] Bachelor [*] High Diploma [ ] Master [ ] PhD [ ]	
Semester	5	
Qualification	PhD	
Scientific Title	Lecturer	
ECTS (Credits)	3	
Module type	Prerequisite [ ] Core [1] Assist. [ ]	
Weekly hours		
Weekly hours (Theory)	(2)hr Class	(79)Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(121)Total hrs Workload
Number of Weeks	14	
Lecturer (Theory)	Dr. Lizan Mahmood Khorsheed	
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Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites		

Course Book

Course Description	The purpose of this course is to promote learning by examining underlying assumptions, seeking relevant information, and reaching final conclusions, thus understanding the implications of the Thermodynamics. Thermodynamics began as a science of the motive power of fire. It emerged during the industrial revolution in the 1800s, one hundred years after many inventions of engines. Today, every thermodynamics treatise begins with the laws of thermodynamics (the first and the second) and continues with thick volumes of applications (graphs, tables, and formulas) that teach the reader how to use thermodynamics purposefully, to produce more power to improve human life, and to elucidate natural phenomena (bio and non- bio) that can be put to human use.
Course objectives	Upon completion of this course the student will be able to: 1. To be able to use the First Law of Thermodynamics. 2. To be able to state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy. (Quiz, self-assessment). 3. To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems. 4. To be able to explain how various heat engines work (e.g. a refrigerator, an IC engine, a jet engine). 5. To be able to apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.). 6. To be able to explain at a level understandable by a non-technical person the concepts of path dependence/independence and reversibility / irreversibility of various thermodynamic processes. 7. To be able to apply ideal cycle analysis to simple heat engine cycles to estimate thermal efficiency and work as a function of pressures and temperatures at various points in the cycle.
Student's obligation	The student must attendance the hall 2 hour/week. 1. Detailed lecture notes are available on the web (for viewing and/or downloading). You should download a copy of these and bring them with you to lecture. 2. Preparation and participation will be important for learning the material. You will be responsible for studying the notes prior to each lecture. Several reading assignments will be given to help promote this activity (1/3 of participation grade). 3. Several active learning techniques will be applied on a regular basis (turn-to-your-partner exercises, muddiest part of the lecture, and ungraded concept quizzes). We will make extensive use of the PRS system (2/3 of participation grade). 4. Homework problems will be assigned (approximately one hour of homework per lecture hour). The Unified Engineering collaboration rules apply.
Required Learning Materials	To avoid student bared in the hall lecturer uses several tools, whiteboard, data show and other demonstrate tools to interest student.

	Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation	Paper Review				
	Assignments	Homework	10%	1	
		Class Activity	2 %		
		Report	8 %	1	
		Seminar	8 %	1	
		Essay			
		Project			
	Quiz		8 %	5	
	Lab.		%		
	Midterm Exam		24%		
	Final Exam		40%		
	Total		100%		

Specific learning outcome:

Upon the completion of this course students will be able to complete the following:

1. Describe basic concepts of Thermodynamics.
2. Use thermodynamic terminology correctly.
3. Explain fundamental thermodynamic properties.
4. Derive and discuss the first and second laws of thermodynamics.
5. Solve problems using the properties and relationships of thermodynamic fluids.
6. Analyse basic thermodynamic cycles.
7. Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.
8. The understanding of thermodynamic properties and processes will assist students in other related coursework.

Course References:

1. MICHAEL J. MORAN, HOWARD N. SHAPIRO "Fundamentals of Engineering Thermodynamics" Eighth Edition, WILEY 2008.
2. R. K. Rajput, "ENGINEERING THERMODYNAMICS" T H I R D E D I T I O N, LAXMI PUBLICATIONS (P) LTD 2007.
3. M.C.Potter, C.W. Somerton, "THERMODYNAMICS FOR ENGINEERS ", Schaum's outlines, McGRAW-HILL, 1993.

Introduction	Week	Learning Outcome
Basic Concepts – Types of systems, Macroscopic and Microscopic, Viewpoints	1	1
Thermodynamic Equilibrium- State, Property, Process, Cycle, Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility	2	1
Work and Heat, Point and Path functions, Zeroth Law of Thermodynamics – Principles of Thermometry	3	2
PMM I - Joule's Experiment – First law of Thermodynamics, Steady Flow Energy Equation	4	2,3
Limitations of the First Law - Thermal Reservoir	5	2,3
Heat Engine, Heat pump, Parameters of Performance	6	1
Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, Corollaries, PMM of Second kind	7	4
Carnot's principle, Carnot cycle and its specialties	8	7
Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation	9	5
Availability and Irreversibility	10	4
Power Cycles, Otto cycle, Diesel cycle	11	8
Dual Combustion cycle, Brayton cycle	12	7
Thermal Efficiency, Comparison of Cycles	13	8
Basic Rankine cycle Performance Evaluation.	14	8

Questions Example Design

Compositional:

1. List EXAMPLES OF IRREVERSIBLE PROCESSES.
2. Talk about **FIRST LAW OF THERMODYNAMICS**.

2. True or false type of exams:

1. The change in entropy of a closed system is the same for every process between two specified states. (T)
2. A process that violates the second law of thermodynamics violates the first law of thermodynamics. (F)

3. Multiple choices:

1. Which of the following follows the Carnot theorem?

A. Heat engines
B. Gas turbine engines
C. Gas compressors
D. All of the mentioned

Extra notes:

Student must be any time ready for quizzes.

External Evaluator

I have read the terms of this article and acknowledge that it meets the required purpose.

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