

MODULE DESCRIPTION FORM

Module Information					
Module Title	Thermodynamics			Module Delivery	
Module Type	Core			<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	UOMU0201031				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	2	Semester of Deliver			
Administering Department	PM	College	TE		
Module Leader	Mohamed Maitham Obaid		e-mail	Mohamed.Maitham @uomus.edu.iq	
Module Leader's Acad. Title	lecturer		Module Leader's Qualification		Ph.D
Module Tutor	Hassan Ghanim Hassan		e-mail	E-mail	
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	01/06/2023		Version Number	1.0	

Relation with other Modules				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

<p align="center">Module Objectives</p>	<ol style="list-style-type: none"> 1. The aim is to enhance problem-solving abilities and gain a comprehensive comprehension of thermodynamics theory by utilizing various methodologies. 2. The objective is to grasp the principles of thermodynamics and the laws governing energy. 3. The course primarily focuses on the fundamental notions of heat, work, and energy. 4. This subject serves as a foundational component for understanding different systems employed in thermodynamics. 5. The goal is to comprehend the principles that govern the conversion of energy between different thermodynamic systems. 6. Students will be introduced to the field of thermodynamics through the examination of thermal systems and their interactions with the surrounding environment in terms of energy.
<p align="center">Module Learning Outcomes</p>	<ol style="list-style-type: none"> 1. Classify and define various terms related to thermodynamics. 2. Provide a concise explanation of the concept of thermodynamics. 3. Analyze the involvement and behavior of atoms in chemical reactions. 4. Explain the concepts of thermal energy, work, and energy in the context of thermodynamics. 5. Define Boyle's law and understand its significance in thermodynamics. 6. Differentiate between open and closed systems and comprehend their respective applications. 7. Explore the processes of heat transfer between thermal systems. 8. Evaluate the characteristics and functions of measuring devices used in laboratory settings. 9. Elaborate on Joule's law and its implications in thermodynamics. 10. Identify and apply relevant mathematical relationships for problem-solving purposes.
<p align="center">Indicative Contents</p>	<p><u>Part A</u></p> <p>Course Introduction: This initial module provides an introduction to the course, including an overview of the content and objectives. It also introduces the recommended textbooks and outlines the different units that will be covered. [15 hrs]</p> <p>Key Definitions: In this module, we will focus on important definitions related to force, pressure, and system. By understanding these fundamental concepts, students will be better equipped to grasp the subsequent topics. [15 hrs]</p> <p>Pressure and its Types: This module explores the concept of pressure in detail, examining its various types and their respective characteristics and applications. Students will spend significant time understanding and analyzing pressure in different contexts.. [10 hrs]</p>

	<p>Specific Heat at Constant Pressure and Volume: This module covers specific heat and its variations under constant pressure and constant volume conditions. Students will gain an understanding of the significance of specific heat and its practical implications. The module will also address closed system procedures, including those related to constant volume and constant pressure conditions. [15 hrs]</p> <p>Revision problem classes [6 hrs]</p> <p><u>Part B</u></p> <p>Fundamentals:</p> <p>Temperature: This section covers the measurement of temperature, including units of measurement, conversion between different scales, various measuring methods, and the principles of the Zeroth Law of Thermodynamics.</p> <p>Energy: The concept of energy is defined, and different forms of energy such as potential, kinetic, and thermal energy are explained. Work, capacity, flow work, and pressure diagrams are also discussed. Internal energy and enthalpy are introduced as important thermodynamic properties. [9 hrs]</p> <p>Steam Procedures and Pressure-Volume Chart: This topic focuses on the procedures related to steam and their representation on a pressure-volume chart. Students will learn about the behavior of steam during various processes and how to interpret and analyze such processes graphically. [10 hrs]</p> <p>Types of Pressure Gauges in Refrigeration: This section covers the different types of pressure gauges commonly used in refrigeration systems. Students will become familiar with these gauges, their working principles, and their specific applications in refrigeration processes. [6 hrs]</p> <p>Types of Air Velocity Gauges and Their Uses: This topic explores the various types of air velocity gauges and their respective uses. Students will learn about the different instruments used to measure air velocity and how these measurements are relevant in various contexts, such as HVAC systems or airflow analysis. [6 hrs]</p>
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Learning and Teaching Strategies	
Strategies	The primary methodology employed in delivering this module aims to actively involve students in exercises that will enhance their critical thinking skills and promote engagement. This will be achieved through a combination of lectures, interactive tutorials, and the inclusion of various types of simple

	experiments. These experiments will be designed to captivate students' interest and provide hands-on experience in the subject matter. The overall objective is to encourage active learning, foster critical thinking, and create an engaging learning environment for the students.
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Student Workload (SWL)			
Structured SWL (h/sem)	123	Structured SWL (h/w)	8
Unstructured SWL (h/sem)	52	Unstructured SWL (h/w)	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	3, 5, 8 and 11	LO #1, #2, #5, and #8
	Assignments	3	10% (10)	4, 9 and 12	LO #3, #4, #6, #9
	Projects / Lab.	10	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction and Basic Concepts
Week 2	Properties of Pure Substances
Week 3	Steam Power Plants
Week 4	Rankin reheat cycle

Week 5	Isentropic efficiencies of steady flow devices
Week 6	Regenerative cycle
Week 7	Gas mixtures
Week 8	Real Gases
Week 9	Thermodynamics of combustion
Week 10-11	Positive Displacement Machine
Week 12-13	Gas Turbine
Week 14-15	Steam Turbine

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Laboratory Safety and Equipment
Week 2	Measurement of specific heat ratio of air
Week 3	Operating Parameters of VCR
Week 4	Saturated vapor pressure and temperature relation
Week 5	steam boiler efficiency
Week 6	Determination the phase of the refrigerant for VCR system components
Week 7	vapor dryness fraction measurements
Week 8	Determination of the evaporation latent heat

Week 9	Determination of thermal efficiency for VCR cycle
Week 10	EES software training

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> 1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles 2. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisy D. Boettner, and Margaret B. Bailey 3. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart 	No
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Websites	<p>(https://www.khanacademy.org/science/physics/thermodynamics)</p> <p>(https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/)</p> <p>(https://www.engineeringtoolbox.com/thermodynamics-d_28.html)</p>	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Code	Course/Module Title	ECTS	Semester
PM 205	Thermodynamics	7	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	4	123	52
Description			
<p>Thermodynamics is a branch of physics that deals with the study of energy and its transformations in various systems. It focuses on understanding the behavior of heat, work, and energy flow. Thermodynamics encompasses fundamental principles such as the laws of thermodynamics, which describe the relationships between energy, heat, and work. It explores concepts like temperature, pressure, entropy, and equilibrium. Thermodynamic principles find applications in various fields, including engineering, chemistry, and environmental science. By analyzing thermodynamic processes and systems, scientists and engineers can optimize energy utilization, design efficient engines and power plants, and understand the behavior of substances under different conditions.</p>			