



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thermodynamics principles		Module Delivery
Module Type	C		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar
Module Code	PM 102		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester of Deliver	2
Administering Department	PM	College	TEMO
Module Leader	Mothana M. Mohamed Salih	e-mail	Muthanam.m1981@ntu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification	M.Tech. Mechanical Engineering
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/6/2024	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives</p> <p>أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> 1. To develop problem solving skills and understanding of thermodynamics theory through the application of techniques. 2. To understand thermodynamics and energy law. 3. This course deals with the basic concept of heat, work and energy. 4. This is the basic subject for all cases of systems used in thermodynamics. 5. To understand the laws of energy conversion between thermodynamics systems. 6. Introducing students to thermodynamics by studying thermal systems in terms of energy interactions with its immediate surroundings.
<p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> 1. Recognize how temperature gauges work in laboratory equipment. 2. List the different thermodynamics terms. 3. Summarize what is meant by thermodynamics. 4. Discuss the reaction and participation of atoms in chemical reactions. 5. Describe thermal energy, work and energy. 6. Define Boyle's law. 7. Identify open and closed systems and their applications. 8. Discuss the heat transfer processes between thermal systems. 9. Discuss the different characteristics of the measuring devices used in the laboratory. 10. Explanation of Joule's law. 11. Identify the mathematical relationships in solving problems.
<p>Indicative Contents</p> <p>المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><u>Part A</u></p> <ul style="list-style-type: none"> ● Introduction - Textbooks - Units. Important definitions - force - pressure - system. Pressure and its types [15 hrs] ● Vapor - Forms of matter when changing its phase - Drawing the phase change of matter on the pressure-volume chart. [15 hrs] ● Specific heat at constant pressure - specific heat at constant volume. Closed system procedures - constant volume - constant pressure. [10 hrs] ● Energy Equation for Systems: Open and Closed - Applications [15 hrs] ● Revision problem classes [6 hrs] <p><u>Part B</u></p> <ul style="list-style-type: none"> ● Fundamentals

	<ul style="list-style-type: none"> • Temperature: Units - Conversions - Measuring Methods - Zero Law. Definition of energy - forms of energy: potential, kinetic, thermal - work - capacity - flow work - pressure diagram. internal energy - enthalpy [15 hrs] • Steam procedures and their projection on the pressure-volume chart [7 hrs] • Identify the types of pressure gauges used in refrigeration - types of air velocity gauges and their uses. [15 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	<p>The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.</p>
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	6	10% (10)	3,5,7,9,11 and 15	LO #2, #3,#5,#7,#9 and #11
	Assignments	4	10% (10)	2,6,8 and 12	LO #1, #4, #6and #10
	Projects / Lab.	4	20% (20)	Continuou s	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introductions, references, units , General notations , about pressure, force, work etc.
Week 2	Temperature, unit of temperature and conversion, temperature measurements. Zeroth law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.
Week 3	First law of thermodynamics
Week 4	Steady flow energy equation for open system, non-flow energy equation for closed system, Ideal gas and equation of state
Week 5	Ideal gas, Boyle's law and Charles law and equation of state
Week 6	Specific heat at constant pressure and constant volume, closed system Processes using ideal gas. Isometric and isobaric processes.
Week 7	Isothermal and adiabatic processes
Week 8	Polytropic processes



Week 9	open system processes
Week 10	Vapor, phase of substance, Phase change curve on P-V diagram.
Week 11	Dryness fraction, liquid and vapor lines, wet vapor
Week 12	Steam tables and Examples on steam tables
Week 13	Superheated vapor, tables of superheated tables.
Week 14	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system
Week 15	Second law of thermodynamics, heat engine, heat pump
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Identify the types of pressure gauges used in refrigeration and their uses.
Week 2	Lab 2: Identify the types of air velocity gauges and their uses.
Week 3	Lab 3: Identify the types of temperature measurements used in refrigeration and their uses.
Week 4	Lab 4: Types of heat pumps with a study of the efficiency of the heat pump.
Week 5	Lab 5: compression cycle performance
Week 6	Lab 6: The real refrigeration cycle
Week 7	Lab 7: Filters

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thermal engineering (eighth edition) R. K. RAJPUT	No
Recommended Texts	Fundamentals of heat and mass transfer (M. Thirumaleshwar)	No
Recommended Texts	Heat and mass transfer (SI UNITS) (Er. R. K. RAJPUT) (S. CHAND)	No



Websites	
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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 102	Thermodynamics principles	8	2
Class (hr/w)	Lect/Lab./Prac./Tutor	(SSWL (hr/sem	(USWL (hr/sem
3	5	108	92
Description			
<p>In this thermodynamics module, students will explore the foundational concepts that form the basis of this field of study. They will examine energy interactions in thermal systems and measure relevant properties. Key concepts covered include force, energy, work, thermal equilibrium, and temperature. The workshop aims to develop a clear understanding of thermodynamics and its application in engineering. Students will also learn about the practical implications of thermodynamics, such as the laws of heat transfer and their applications in engine cycles. Additionally, they will explore the functioning of refrigerators and heat pumps based on the reversed Carnot cycle, which requires external work to transfer heat from a lower temperature body to a higher temperature body.</p>			