

	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa Engineering Department Refrigeration and Air Conditioning Techniques Engineering	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thermodynamics 1		Module Delivery
Module Type	C	☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MPAC108		
ECTS Credits	6		
SWL (hr/sem)	144		
Module Level			1
Administering Department		Refrigeration and Air Conditioning Techniques	College
			Engineering
Module Leader	Audai Hussein		e-mail
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Module Leader's Acad. Title	Professor Doctor		Module Leader's Qualification
			PHD
Module Tutor	Zainab Abdul Karim Salem		e-mail
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Peer Reviewer Name			e-mail
Scientific Committee Approval Date	3 /09/2025		Version Number
			1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	Semester	
Co-requisites module	NA	Semester	
Module Aims, Learning Outcomes and Indicative Contents			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	Studying the principles of thermodynamics including, thermal systems according to energy interactions with their direct surroundings, the differences in the properties of both the system and the surrounding with their engineering applications		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To know the basic properties of material with units 2. To know the laws of thermodynamics 3. To know the phases of substance 4. To know the basic thermodynamic cycles 5. To know the entropy 6. To know the basics on combustion		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Laws of thermodynamics</u> First and second law of thermodynamics. [24 hrs.] <u>Part B – P-V diagram</u> P-v diagram of water and different gases. Phases of the water and substances. [16 hrs.] <u>Part C – Thermal cycle</u> Carnot cycle, vapor cycle, steam cycle, gas cycle, Otto cycle, Diesel cycle, duel cycle, and duel cycle. [58 hrs.] <u>Part D – Combustion</u> Combustion, combustion and equilibrium equations [24 hrs.]		

Learning and Teaching Strategies					
استراتيجيات التعلم والتعليم					
Strategies		Assessment is based on hand-in assignment, written exams, case study, quizzes, seminars and practical testing.			
Student Workload (SWL)					
الحمل الدراسي للطالب					
Structured SWL (h/sem)		144	Structured SWL (h/w)		10
الحمل الدراسي المنتظم للطالب خلال الفصل			الحمل الدراسي المنتظم للطالب أسبوعيا		
Unstructured SWL (h/sem)		56	Unstructured SWL (h/w)		10
الحمل الدراسي غير المنتظم للطالب خلال الفصل			الحمل الدراسي غير المنتظم للطالب أسبوعيا		
Total SWL (h/sem)		200			
الحمل الدراسي الكلي للطالب خلال الفصل					
Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	5	5 % (5)	2,5,8,10,13	LO # 1, 4, 5, 7,8
	Assignments	5	5 % (5)	1,4,7,11,15	LO # 1-15
	Lab.	10	10 % (10)	1-9	LO # 1-15
	Report	10	10 % (10)	1-8	LO # 1-15
Summative assessment	Midterm Exam	3 hr.	20 % (20)	9	LO # 1-15
	Final Exam	3 hr.	50% (50)	15	All
Total assessment			100% (100 Marks)		
Delivery Plan (Weekly Syllabus)					
المنهاج الاسبوعي النظري					
	Material Covered				
Week 1	Introductions, references, units, pressure, force, work, Temperature, unit of temperature and conversion, temperature measurements. Zeorith law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.				
Week 2	First law of thermodynamics, Steady flow energy equation for open system, non-flow energy equation Transient state,				

Week 3	Ideal gas, Boyle's law and Charles law and equation of state, Specific heat at constant pressure and constant volume, Closed system processes using ideal gas. Isometric and isobaric processes
Week 4	Isothermal and adiabatic processes, Polytropic processes, Control volume processes
Week 5	Vapour, phase of substance, Phase change curve on P-V diagram. Dryness fraction, liquid and vapour lines, wet vapour
Week 6	Steam tables and Examples on steam tables, Super-heated vapour, tables of super-heated tables
Week 7	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system, Second law of thermodynamics, heat engine, heat pump
Week 8	Carnot cycle and reversed Carnot cycle. Irreversible and reversible processes
Week 9	Clausius in equality for second law, Entropy on T-S and entropy calculations.
Week 10	Entropy for vapour, Entropy for system and surroundings, Isentropic efficiency
Week 11	Air standard cycle, Otto cycle. Diesel and Dual cycles
Week 12	Steam power plants- Rankin Cycle, Rankin Cycle with superheated. Modified Rankin Cycle
Week 13	Modification on Carnot to use as vapour compression cycle. Vapour compression cycle,
Week 14	Combustion, combustion equations, equilibrium of combustion equation. Volumetric analysis on combustion process
Week 15	Final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Measurement and instruments
Week 2	Types of temperature measurements
Week 3	Measuring the velocity of air
Week 4	Calibration of thermocouple
Week 5	Joule experiment
Week 6	Boyle Experiment
Week 7	Measuring of C.V of fuel
Week 8	Measuring specific heats
Week 9	Finding the law of expansion
Week 10	Measuring the latent heat of evaporation
Week 11	Heat pump
Week 12	finding of the degree of superheating

Week 13	Performance of simple compression cycle
Week 14	Actual vapour compression cycle
Week 15	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Borgnakke, C. and Sonntag, R.E., 2022. <i>Fundamentals of thermodynamics</i> . John Wiley & Sons. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. <i>Thermodynamics: an engineering approach</i> . New York: McGraw-hill. Rajput, R.K., 2005. <i>A textbook of engineering thermodynamics</i> . Laxmi Publications.	Yes

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.