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	UOMU021029		
ECTS Credits	8		
SWL (hr/sem)	240		
Module Level	1	**Semester of Delivery**	2
Administering Department	Air-conditioning and Refrigeration Eng. Tech. Dep.	**College**	UOMU
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	15/07/2023	**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	
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. Part A – Laws of thermodynamics First and second law of thermodynamics. [24 hrs.] Part B – P-V diagram P-v diagram of water and different gases. Phases of the water and substances. [16 hrs.] Part C – Thermal cycle Carnot cycle, vapor cycle, steam cycle, gas cycle, Otto cycle, Diesel cycle, and duel cycle. [58 hrs.] Part D – Combustion 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) الحمل الدراسي المنتظم للطالب خلال الفصل	144	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	240		

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	5% (5)	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	Vapor, phase of substance, Phase change curve on P-V diagram. Dryness fraction, liquid and vapor lines, wet vapor.
Week 6	Steam tables and Examples on steam tables, Super-heated vapor, 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 vapor, 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 vapor compression cycle. Vapor 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 vapor 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. *Fundamentals of thermodynamics*. John Wiley & Sons. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. *Thermodynamics: an engineering approach*. New York: McGraw-hill. Rajput, R.K., 2005. *A textbook of engineering thermodynamics*. 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.