	Ministry of Higher Education and Scientific Research - Iraq Al-Mustaqbal University College for engineering and technology Department of Biomedical Engineering	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Thermodynamics I		**Module Delivery**	
Module Type	CORE		☐ **Theory** ☐ **Lecture** ☐ **Tutorial**	
Module Code	UOMU0102052			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	**Semester of Delivery**	1	
Administering Department		**College**		
Module Leader	Dr. Saqr Mohammed Khalaf	**e-mail**	Saqr.mohammed.khalaf@uomus.edu.iq	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**		
Module Tutor	Dr. Saqr Mohammed Khalaf			
Peer Reviewer Name	Dr. Saqr Mohammed Khalaf	**e-mail**	Saqr.mohammed.khalaf@uomus.edu.iq	
Review Committee Approval	2/10/2025	**Version Number**		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Chemical Eng. Principles III	**Semester**	2
Co-requisites module	None	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	1. To familiarize the students with basic concepts of the first and second laws of thermodynamics and their applications in engineering problems. 2. Develop a practical ability to solve Chemical Engineering Principle II problems, minimum work. 3. Students will demonstrate basic understanding of basics and definitions of thermodynamics and properties of pure substances. 4. Describe the reversible and irreversible processes (macroscopic description of ideal and real processes).		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will be able to apply thermodynamic laws to variety of engineering problems. 2. By examining ideal gas and true gas behavior, students will be able to establish pressure, volume, and temperature relationships for pure substances and mixtures. 3. Students will be able to compute heat requirements for a process with specified chemical reactions and specified inlet and outlet temperatures. 4. Students will be able to comprehend the existence of entropy as a state function, related to observable properties of a system and compute ideal work, lost work, and thermodynamic efficiencies of processes. 5. Students will be able to calculate the heat and work requirements of chemical processes. 6. Students will be able to apply the second and third laws of thermodynamics to various engineering problems Students will be able to conduct a thermodynamic analysis of heat-generating systems by examining the relationship between work and heat.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Introduction**: Basic definitions, work, energy, heat, types of systems, extensive and intensive properties, thermodynamic processes, zero law of thermodynamics, 1st law of thermodynamic, energy balance for open and close system. (**3 hrs**) 2. **Volumetric Properties of Pure Fluids**: Review on virile equation of state, cubic equation of state, generalized correlations for gases and for liquids. (**9 hrs**) 3. **Heat Effects**: Heat capacity calculations, sensible heat, latent heat, standard heat of reaction, heat effect of industrial reactions. (**6 hrs**) 4. **The 2nd Law of Thermodynamics:**		

	Review on the 2nd law and Carnot heat engine, entropy balance for open system, calculation of ideal work, lost work. (**9 hrs**) 5. **Thermodynamic Properties of Fluids**: Review on the property relations (ΔH, ΔS, ΔU and ΔG); residual properties, two phase systems, thermodynamic diagrams and tables, generalized property correlations for gases.(**9 hrs**) **7. Applications of Thermodynamics to Flow Processes**: Duct flow of compressible fluids, Pipe flow, Nozzles, Throttling process, Turbines, Compression processes compressors, Ejectors; The steam power plant, Carnot cycle, Rankin cycle, the regenerative cycle. (**9 hrs**)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	127		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO #1,2, 3, 4 ,5 and 6
	Assignments	3	12% (4)	continuous	
	On line assignment	2	8% (4)		
	Report	1	5% (5)	14	LO # 7
Summative assessment	**Midterm Exam**	2Hr.	10% (10)	10	LO # 1,2, 3, and 4
	Final Exam	3Hr.	50% (50)	16	ALL
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction: Basic definitions, work, energy, heat, types of systems, extensive and intensive properties, thermodynamic processes, zero law of thermodynamics, 1st law of thermodynamic, energy balance for open and close system.
Week 2	Volumetric Properties of Pure Fluids: Review on virile equation of state.
Week 3	Cubic Equations of State.
Week 4	Generalized Correlations for Gases and for Liquids.
Week 5	Heat Effects: heat capacity calculations, sensible heat, latent heat.
Week 6	Standard Heat of Reaction, Heat Effects of Industrial Reactions.
Week 7	The 2nd Law of Thermodynamics: Review on the 2nd law and Carnot heat engine
Week 8	Entropy Balance for Open System.
Week 9	Calculation of Ideal work, Lost work.
Week 10	Thermodynamic Properties of Fluids: Review on the property relations (ΔH, ΔS, ΔU and ΔG).
Week 11	Residual Properties, two phase systems, thermodynamic diagrams and tables.
Week 12	Generalized Property Correlations for Gases.
Week 13	Applications of Thermodynamics to Flow Processes: Duct flow of compressible fluids, pipe flow.
Week 14	Nozzles, Throttling process, Turbines, Compression processes, Compressors, Ejectors.
Week 15	**The steam power plant, Carnot cycle, Rankin cycle, the regenerative cycle.**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	J. M. Smith, H. C. Van Ness, Introduction to chemical engineering thermodynamics, 8th edition (International Edition), McGraw Hall, 2018.	Yes
Recommended Texts	1. K. V. Narayanan, A textbook of chemical engineering thermodynamics, prentice Hall of India, New Delhi, 2011. 2. B. G. Kyle, Chemical and process thermodynamics, (3rd Edition), prentice Hall Inc. New Jersey, 1984. 3. J. Rayner, Basic engineering thermodynamics in SI units, printed in great Britain,1971.	Yes

Websites	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي