MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

	Module Information معلومات المادة الدراسية				
Module Title	**Heat Transfer- conduction**				**Mod**
Module Type	**Core**				
Module Code	**ATU12052**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	1			**Semester of Delive**	
Administering Department	ATU12	**College**	PMTEC	Type C	
Module Leader	Name	**e-mail**		E-mail	
Module Leader's Acad. Title	Professor			**Module Leader's Q**	
Module Tutor	Name (if available)	**e-mail**		E-mail	
Peer Reviewer Name	Name	**e-mail**		E-mail	
Scientific Committee Approval Date	01/06/2023			**Version Number**	

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 Objectives أهداف المادة الدراسية	1. To develop problem-solving skills and an understanding of methods of heat transfer through the application. 2. To understand conduction, convection, and radiation heat transfer 3. This course deals with the basic concept of fins. 4. This is an essential subject for all thermal applications. 5. To perform mesh and Node analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize how the heat is transferred by three methods 2. Define the Fourier's law, Newton's law of cooling and Stefan–Boltzmann law. 3. Explain the general Heat Conduction Equation 4. Summarize what is meant by the Boundary and Initial Conditions 5. Discuss the type of heat exchangers. 6. Describe the convection heat transfer systems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

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	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	**175**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
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)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - General concepts and definitions - Heat conduction - Convective heat transfer - Thermal radiation
Week 2	Conduction heat transfer (general equation) - General heat conduction equation - One-dimensional, steady state, conduction through plane wall, Conduction heat transfer (1-D, steady state) - Composed wall - Cylinder, composed cylinder - Sphere, composed sphere
Week 3	Conduction heat transfer (1-D, steady state, with heat generation) in - Plane wall - Composed wall - Solid cylinder - Hollow cylinder - Sphere - Critical thickness of insulation,
Week 4	Heat transfer through extended surfaces (fins) - General equation for temperature distribution. - Very long fin - Short fin - End insulated fin - Effectiveness of the fin - Applications for previous subjects
Week 5	unsteady state heat conduction equation, lumped system analysis, Transient Heat Conduction In Large Plane Walls, Long Cylinders, and Spheres With Spatial Effects, Formulation of One Dimensional Transient Temperature Distribution. T(x, t), Approximate Analytical Solution, Approximate Graphical Solution
Week 6	Transient Heat Conduction In Semi-infinite Solids, Sudden Change In Surface Temperature, Suddenly Imposed Surface Heat Flux, Specified surface heat flax, Suddenly Imposed Convection Boundary condition

Week 7	2-D, Steady state heat conduction - Analytical solution with different boundary conditions - Exact Solution with different boundary conditions - Numerical solution for two-D steady state heat conduction equation (nodes)
Week 8	2-D Unsteady state heat conduction - Analytical solution for the. (lumped system) - Numerical solution
Week 9	Convective heat transfer - Fluid flow background - Laminar and turbulent flow - Boundary layer growth for external flow and internal flow, Forced convection - Energy equation -
Week 10	Thermal boundary layer and temperature distribution and heat transfer for: Laminar flow over flat plate Laminar flow through closed conduit - Empirical equation for cross flow for cylinder, sphere and tube bank - Empirical equation for turbulent flow
Week 11	Heat exchanger - General concepts - Types of heat exchangers - Heat exchangers performance by LMTD method - Heat exchanger's effectiveness. - NTU method
Week 12	Sinusoidal Forcing, Complex Forcing, Phasors, and Complex Impedance, Sinusoidal Steady State Response
Week 13	Thermal radiation - Introduction to thermal radiation - The electromagnetic waves - The black body - The shape factor - Thermal radiation between: Two parallel plates (gray) Two concentric cylinder
Week 14	Thermal radiation between more than two bodies. -
Week 15	Thermal resistance network - Radiation shields
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Thermal conductivity
Week 2	Lab 2: Pin Fins
Week 3	Lab 3: Fins
Week 4	Lab 4: forced convection 1
Week 5	Lab 5: forced convection2
Week 6	Lab 6: Free convection
Week 7	Lab 7: Heat exchangers

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	Heat Transfer A Practical Approach, YUNUS A. CENGEL, McGraw-Hill Education	Yes
Recommended Texts	**Heat Transfer,** J. P. Holman	No
Websites		

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.