MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Heat Transfer 1			**Module Delivery**	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOMU0206051				
ECTS Credits	6				
SWL (hr/sem)	180				
Module Level		UGIII	**Semester of Delivery**		Five
Administering Department		**Fuel and Energy Techniques Engineering Department**	**College**	**Engineering Technical college**	
Module Leader	**Ammar Abdulkadhim Fathi**		**e-mail**	ammarabdulkadhim@uomus.edu.iq	
Module Leader's Acad. Title		**Assistant Professor Dr.**	**Module Leader's Qualification**		**Ph.Dr. Mechanical power engineering**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1	

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	1. To Analyze heat conduction, forced convection and Free convection. 2. To Explain basic physical processes of condensation and boiling. 3. To Analyze basic heat transfer experiments. 4. To Analyze heat transfer by radiation using shape factors and networks. 5. To Use LMTD and NTU-Effectiveness methods to predict the size and performance of heat exchangers. 6. To Design of heat exchangers.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to analyze basic heat transfer 2. Ability to analyze heat conduction 3. Ability to solve numerical heat conduction 4. Ability to solve fin problems 5. Ability to build heat conduction network 6. Ability to explain the forced convection 7. Ability to explain Free convection. 8. Ability to Explain basic physical processes of condensation and boiling. 9. Ability to analyze heat transfer by radiation using shape factors and networks. 10. Ability to Use LMTD and NTU-Effectiveness methods to predict the size and performance of heat exchangers. 11. Ability to Design of heat exchangers.
Indicative Contents المحتويات الإرشادية	<u>Introduction</u> Heat transfer – Units. Types of heat transfer- thermal conductivity [15 hrs.] <u>Conduction Heat Transfer</u> Definitions, thermal resistance, electric analog, Heat conduction through the plane, cylinder and spherical walls. [15 hrs.] <u>Temperature distribution</u> Temperature distribution through plane wall, cylindrical, and spherical wall Composite wall ,heat transfer coefficient, The overall of heat transfer coefficient. Insulations, critical thickness of insulation [10 hrs.] <u>Fins</u> Fins Types, Types of Temperature distribution along fins, Annular fine calculation, application[10 hrs.]

	Conduction into 2D Analytical and Numerical solutions [8 hrs.] Convection Heat Transfer Forced convection, flow over flat plat, Application of forced convection, dimensionless numbers. Thermal and velocity boundary layers. Force convection flow into pipe laminar and turbulent flows [12 hrs.] Free convection Thermal and velocity boundary layers [7 hrs.] Heat exchangers Types of heat exchangers. Logarithm mean temperature difference (LMTD). Single pass and multipass heat exchangers; plate heat exchangers; heat exchangers effectiveness; Design of heat exchanger using NTU. Fouling factors and Wilson's plot. [15 hrs.] Evaporation and Condensation Boiling, types of boiling, Boiling curve, imperials relations. types of condensations, empirical relations[15 hrs.] Radiation Heat transfer Concept of thermal radiations - Black body - Stefan Boltsman's law - grey body – radiation between surfaces. [12 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 are 1. Teamwork 2. Visualization 3. Inquiry-Based Teaching 4. Student-led Classroom 5. Implementing Technology in the Classroom 6. Auditory strategies

	7. Reading & Writing

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	74	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	106	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	180		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, Definitions

	Units and symbols Theory of Heat Transfer Thermodynamics and Heat Transfer
Week 2	Heat Transfer Mechanism Conduction Heat Transfer Convection Heat Transfer Radiation Heat Transfer
Week 3	Thermal Resistance and Electric Analog Heat Conduction Through the Plane, Cylinder, Spherical Walls,
Week 4	Numerical Methods in Heat Conduction 1D, 2D, 3D Transient Heat Conduction
Week 5	Convection Heat Transfer Dimensionless Numbers
Week 6	Free (internal and external) Convection Heat Transfer Forced (internal and external) Convection Heat Transfer
Week 7	Radiation Heat Transfer Definitions Thermal Radiations, Black Body Radiations
Week 8	Radiation Between Surfaces (View Factor Relations) Atmospheric And Solar Radiation
Week 9	Boiling and Condensation Definitions Types of Boiling
Week 10	Boiling Curve Types of Condensations
Week 11	Fins Definitions Types of Fins
Week 12	Types of Temperature Distribution Along Fins Annular Fine Calculation
Week 13	Heat Exchangers Definitions Types of Heat Exchangers

Week 14	Logarithm Mean Temperature Difference (LMTD) and Effectiveness Design of Heat Exchanger Using NTU
Week 15	Fouling Factors And Wilson's Plot.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: calculation of thermal conductivity
Week 2	Lab 2: calculation of heat transfer series wall
Week 3	Lab 3: calculation of thermal contact resistance
Week 4	Lab 4: heat transfer in very long fin
Week 5	Lab 5: estimation of heat transfer coefficient in fins
Week 6	Lab 6: steady two dimensional in plate
Week 7	Lab 7: forced convection from cylinder in cross flow

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Hollman J.P., Heat Transfer, McGraw Hill Kern D.Q., Process Heat Transfer, McGraw Hill.	yse
Recommended Texts	Heat-transfer- [YUNUS A. CENGEL]	yes
Websites	https://www.udemy.com/topic/heat-transfer/	

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.