	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al_Anbiyaa Engineering Department Refrigeration and Air Conditioning Techniques Engineering	

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Heat Transfer			**Module Delivery**	
Module Type	C			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC303				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	3		**Semester of Delivery**	1	
Administering Department	Refrigeration and Air Conditioning Techniques.		**College**	Engineering	
Module Leader	Audai Hussein		**e-mail**	audai.Hussein@uowa.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	٣١/٠٨/٢٠٢٥		**Version Number**	1	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC203, MPAC202	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	1. To develop students' fundamental knowledge into Heat transfer principles. 2. To describe the physical principles and evolving technical capabilities of heat transfer 3. To explain the heat transfer mechanisms, conduction, convection, and radiation. 4. To describe the thermal resistance concept, conduction through multilayered plane wall, cylinders and spheres. 5. To describe the Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness. 6. To explain the forced and natural convection heat transfer, boundary layer concepts. 7. To describe the kinds of heat exchangers, heat exchangers design methods. 8. To explain the heat transfer by radiation basic concepts.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Use the information of heat transfer principles. 2. Identify the heat transfer mechanisms. 3. Recognize the forced and natural convection heat transfer. 4. Recognize the kinds of heat exchangers and design methods. 5. Recognize the heat transfer by radiation basic concepts. 6. Use the heat transfer principles in the practical applications.
Indicative Contents	Indicative content includes the following: Heat transfer principles [16hrs]. Introduction to heat transfer mechanisms, conduction, convection, and radiation [16hrs]. Thermal resistance concept, conduction through multilayered plane wall, cylinders and spheres [28hrs]. Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness [16hrs]. Forced and natural convection heat transfer, boundary layer concepts [28hrs]. Heat transfer by radiation basic concepts [24hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	144	**Structured SWL (h/w)**	10
Unstructured SWL (h/sem)	56	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**20% (20)**	**3,6,10,14**	**LO #1,2,3,4,5,6**
	Assignments	**2**	**10% (10)**	**5, 12**	**LO # 2.3.4.5**
	Seminar	**1**	**10% (10)**	**12**	**LO # 1,6**
Summative assessment	**Midterm Exam**	**2 hr**	**10% (10)**	**10**	**LO # 1,2,3**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Introduction, Heat Transfer Mechanisms, Steady State general Heat Conduction equation in Rectangular, Cylindrica and spherical Coordinates.
Week 2	Thermal Resistance Concept, Conduction through Multilayered Plane Wall, Cylinders and Spheres.
Week 3	Over all Heat Transfer Coefficient, Critical Radius of Insulation. Thermal Contact Resistance.
Week 4	Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness
Week 5	Transient Heat Conduction, (Lumped System Analysis) Two-dimensional Steady Heat Conduction, numerical method.
Week 6	Introduction to Heat Transfer by Convection, Review to the Fluid Flow.
Week 7	Non-Dimensional Group Numbers Analysis, Laminar and Turbulent flow.

Week 8	External Forced Convection (on Flat Plate), Boundary layer concept, Empirical Equations
Week 9	Internal Forced Convection (Laminar and Turbulent Flow), Empirical Equations.
Week 10	Natural Convection Heat Transfer, Empirical Equations.
Week 11	Introduction to Heat Exchangers, Kinds of Heat Exchangers
Week 12	The Overall Heat Transfer Coefficient, Fouling Factor, The Log Mean Temperature Difference (LMTD) Method
Week 13	Effectiveness- NTU method, Performanc for Different Kinds of the Heat Exchangers.
Week 14	Heat Radiation, Introduction, Basic Concepts, Absorptivity, Reflectivity, and Transmissivity.
Week 15	Radiation Heat Transfer Between Two Black and Gray Surfaces.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Calculation of thermal conductivity
Week 2	Calculation of heat transfer rate.
Week 3	Calculation of thermal contact resistance
Week 4	Heat transfer in long straight fins
Week 5	Estimating the convection heat transfer coefficient in fins
Week 6	Forced convection from a cylinder in a cross flow
Week 7	Free convection from a cylinder in free flow
Week 8	Parallel flow shell and tube heat exchanger performance
Week 9	Counter flow shell and tube heat exchanger performance
Week 10	Heat Transfer by Radiation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts	➢ Yunus C. Cengel,“ Heat and Mass Transfer”, 6th Edition, Mc Graw-Hill Education, 2020. ➢ J. P. Holman “Heat Transfer”, 10th Edition, Mc Graw-Hill Education, 20١0.	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.

رئيس القسم
ا.م.د محمد حسن عبود
التاريخ: ٣١-٠٨-٢٠٢٥

استاذ المادة
التاريخ : ٣١-٠٨-٢٠٢٥