	Ministry of Higher Education and Scientific Research - Iraq Warith Al-Anbiyaa University College of Engineering Department of Aircraft Engineering	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Heat Transfer II انتقال حرارة II	**Module Delivery**	
Module Type	CORE		**Theory** **Lab** **Tutorial**
Module Code	AIEN362		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester of Delivery**	6
Administering Department	ME	**College**	ME
Module Leader	Prof Dr. Ghanem Kazem Abdel Sada	**e-mail**	ghanim.sada@uowa.edu.iq
Module Leader's Acad. Title	Dr.	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr.	**e-mail**	
Review Committee Approval	01/12/2025	**Version Number**	2025

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	AIEN352	**Semester**	5
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. Defining the Principle of Convective heat transfer. 2. Defining the theoretical basics of the forced convective heat transfer Coincided with a laboratory experiment. 3. This course deals with the empirical relations for pipe and tube. 4. This course deals with the dimensionless numbers like Grashof number, Nusselt number…..etc. 5. Defining the theoretical basics of the free convective heat transfer Coincided with a laboratory experiment. 6. Defining the theoretical basics of the heat exchangers Coincided with a laboratory experiment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize the types of convection heat transfer modes. 2. The relationship between heat transfer and other Sciences, like fluid mechanics and its direct relationship. 3. Discuss the hydraulic boundary layer growth for external flow and internal flow. 4. Recognize the temperature distribution and heat transfer for Laminar flow over flat plate. 5. Recognize the temperature distribution and heat transfer for Laminar flow for closed conduit. 6. Defining the empirical relations for pipe and tube. 7. Defining the empirical relations for natural convection over surfaces. 8. Explanation the concepts of the dimensionless numbers deals with the subject, like Grashof number, Nusselt number…..etc. 9. Discuss the relation between friction factor and heat transfer. 10. Recognize the types of heat exchangers. 11. Explain the log mean temperature difference . 12. Explain the heat exchanger effectiveness and NTU method.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction:(Principle of Convective heat transfer ,fluid flow background, laminar and turbulent flow, boundary layer growth for external flow and internal flow. [4 hrs] Forced convection heat transfer: Energy equation and thermal boundary layer. [5 hrs]

	Temperature distribution and heat transfer for Laminar flow over flat plate, Temperature distribution and heat transfer for Laminar flow for closed conduit.. [10 hrs] Relation between friction factor and heat transfer, Forced convection over cylinder.. [5 hrs] Empirical relation for pipe and tube. [4 hrs] Dimensional analysis, analytical solution. [5 hrs] External Free convection heat transfer: General concepts, Grashof number, Vertical flat plate, Empirical relations for free convection over surfaces (plate, cylinder and sphere). [4 hrs] Internal free convection heat transfer (vertical tube, rectangular duct), application and examples. [6 hrs] Heat exchangers: General concepts, types of heat exchangers, the log mean temperature difference. [10hrs] Heat exchanger effectiveness NTU method, Condensation and vaporization application. [9 hrs]
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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	3,6,9,12	All
	Assignments	2	10% (10)	4, 11	All
	Projects / Lab.	Lab. 5	10% (10)	Continuous	
	Report	-	-	-	
Summative assessment	Midterm Exam	2 hrs.	10% (10)	7	All
	Final Exam	3 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction: Principle of Convective heat transfer. Fluid flow background. Laminar and turbulent flow. Boundary layer growth for external flow and internal flow.
Week 2	Forced convection heat transfer: Energy equation and thermal boundary layer.
Week 3	Temperature distribution and heat transfer for Laminar flow over flat plate
Week 4	Temperature distribution and heat transfer for Laminar flow for closed conduit.
Week 5	Relation between friction factor and heat transfer. Forced convection over cylinder.
Week 6	Empirical relation for pipe and tube.
Week 7	Dimensional analysis, analytical solution.
Week 8	External Free convection heat transfer: General concepts. Grashof number. Vertical flat plate. Empirical relations for free convection over surfaces (plate, cylinder and sphere).
Week 9	Internal Free convection heat transfer: Vertical tube. Rectangular duct.
Week 10	Application and examples
Week 11	Heat exchangers: General concepts.

Week 12	Types of heat exchangers.
Week 13	The log mean temperature difference
Week 14	Heat exchanger effectiveness.
Week 15	NTU method, Condensation and vaporization application.
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Exp. 1: Measurement of thermal conductivity coefficient for solid materials.
Week 2	Exp. 2: Study of fins performance.
Week 3	Exp. 3: Study of forced convection heat transfer from a cylinder surface.
Week 4	Exp. 4: Study of natural convection heat transfer from a cylinder surface.
Week 5	Exp. 5: Study the performance of a double-pipe heat exchanger.
Week 6	Exp. 6:
Week 7	Exp. 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts	1. J. P. Holman, "Heat Transfer", McGraw Hill, tenth Edition 2010. 2. Yunus A. Cengel, " Heat Transfer A practical Approach", McGraw Hill, 2nd Edition, 2002.	No
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:

NB 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.