MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Conduction & Radiation Heat Transfer**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	RETE 300				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Technical Eng. College/ Kirkuk	
Module Leader			**e-mail**	@ntu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	MSc	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**	@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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 understanding of heat transfer through the application of techniques. 2. To understand the principle of heat transfer 3. This course deals with the basic concept of conduction and radiation heat transfer. 4. This is the basic subject for all conduction and radiation heat transfer 5. To understand the conduction heat transfer laws includes the one-dimensional steady state (cartesian, cylindrical, and spherical coordinates), the two-dimensional steady state (numerical solution), and the unsteady state (lumped analysis). 6. To understand the laws of radiation heat transfer, including properties, emissivity, shape factor, and heat exchange between non-black bodies.
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 the conduction heat transfer parameters. 2. Derive thermal conduction resistance for cartesian, cylindrical, and spherical geometries, and they represented with Ohm's law 3. Recognize the use of numerical analysis techniques for solving two-dimensional heat conduction problems. 4. Describe thermal resistance and overall heat transfer coefficient. 5. Discuss the unsteady state conduction heat transfer 6. Discuss important points in the conduction heat transfer part. 7. Identify the principle of radiation heat transfer. 8. Define Kirchhoff's identity, shape factors 9. Heat Exchange between non-black bodies. 10. Representing black and non-black bodies' heat exchange by electric circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Conduction heat transfer</u> Introduction to heat transfer, one-dimensional steady state heat transfer, overall heat transfer coefficient. [20 hrs] Heat source systems, fins theory. [15 hrs] Two-dimensional steady state conduction heat transfer. [10 hrs] Unsteady state heat transfer [5 hrs] Part B- Radiation heat transfer Introduction to Radiation heat transfer, basic concept, radiation properties, shape factors. [10 hrs]

	Heat exchanger between black bodies surface, heat exchange between non-black bodies surface [10 hrs]. Radiation heat exchange between parallel plate shield [5 hrs} Final examination [2 hrs Lab. Section and 3 hrs theory section] Revision problem classes [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary strategy for delivering this module is to encourage students' participation in solving the exercises while at the same time developing their critical thinking skills. This will be accomplished through classes, interactive tutorials, and simple experiments involving enjoyable sampling activities for students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	5	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	6	10% (10)	Continuous	All
	Report	6	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	An introduction to the basic principles of heat transfer and methods of heat transfer
Week 2 & 3	Heat transfer by conduction in the steady state and one-dimensional in shapes (Cartesian, cylindrical, spherical) compound walls, compound cylinders, compound balls
Week 4	Overall heat transfer coefficient, critical thickness of insulating material, thermal contact resistance
Week 5	Heat source systems in walls and cylinders
Week 6 & 7	Types of fins, fin design, fin efficiency, fin efficiency, heat transfer from heat sinks
Week 8 & 9	Two-dimensional steady state conduction heat transfer (Numerical solution)
Week 10	Unsteady state heat transfer (Lumped heat capacity system)
Week 11 & 12	Introduction to heat by radiation, basic concepts, properties of radiation, shape factors
Week 13 & 14	Radiation Heat exchange between the surface of black objects and between the surface of non-black bodies
Week 15	Radiation heat exchange between parallel-plate shield
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Recognize heat transfer lab apparatuses, and learn how the report is written
Week 2	Lab 2: The heat transfer rate is directly proportional to the temperature difference between the two ends of the sample.
Week 3	Lab 3: The heat transfer rate is inversely proportional to the cross-sectional area.
Week 4	Lab 4: Thermal Contact resistance
Week 5	Lab 5: Determine the unknown material's thermal conductivity
Week 6	Lab 6: Materials emissivity evaluation
Week 7	Lab 7: Stefan-Boltzmann experiment

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Heat transfer, J. P. Holman, 13rd Edition, Mc Graw Hill companies, Inc., 1221	Yes
Recommended Texts	Heat transfer; A practical approach, Yunus A. Cengel, 2nd addition,	Yes
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.