Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Erbil Technical Engineering	
Department	Mechanical and Energy Engineering	
Module Name	Heat Transfer I	
Module Code	HET 501	
Degree	Technical Diploma ☐ Bachler ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	Fifth	
Qualification	Ph.D. in Mechanical Engineering	
Scientific Title	Professor	
ECTS (Credits)	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours		
Weekly hours (Theory)	(2)hr Class	(28)Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(26)Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Prof. Dr. Ahmed Mohammed Adham	
E-Mail & Mobile NO.	ahmed.adham@epu.edu.iq; +9647500271523	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites	https://academicstaff.epu.edu.iq/faculty/ahmed.adham	

Course Book

Course Description	The science of thermodynamics deals with the amount of heat transfer as a system undergoes a process from one equilibrium state to another, and makes no reference to how long the process will take. But in engineering, we are often interested in the rate of heat transfer, which is the topic of the science of heat transfer. In this course, the conduction heat transfer mechanism will be explored with a practical approach. Many real life examples will be given to show the students the importance of this course and how helpful it can be for them in their practical life after graduation.
Course objectives	The objective of this course is to study: (1) the concept of conduction heat transfer. (2) steady state heat conduction through wall. (3) fins analysis. (4) critical insulation measurement. (5) Numerical methods to solve conduction problems.
Student's obligation	Student's obligation in the heat transfer course is: • Attendance in the all theoretical and experimental lectures. • Two quizzes, two home works and a seminar in the course. • Examination at the mid and end semester.
Required Learning Materials	• Using data show projector, white board and PowerPoint, Testing in department's Laboratory. • Publish all lecture notes in college website.

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review				
Assignments	Homework	5%	5 & 8	
	Class Activity	2%		
	Report	5%	9	
	Seminar	5%	10	
	Essay			
	Project			
Quiz		8%	4 & 7	
Lab.		10%		
Midterm Exam		25%	6	
Final Exam		40%	12	
Total		100%		

Specific learning outcome:	1- Overview on different heat transfer mechanisms 2- Introduction to conduction heat transfer 3- One dimensional conduction heat transfer 4- Multi dimensional conduction heat transfer 5- Critical radius of Isolation 6- Numerical methods to solve conduction equations
Course References:	1. Heat Transfer by: J. P. Holman 2. A Heat Transfer Textbook by: J. H. Lienhard VI and J. H. Lienhard V. 3. Heat and Mass Transfer by: Hans Dieter Baehr and Karl Stephan 4. Heat and Mass Transfer Data Book by: C. P. Kothandaraman and S. Subramanyan.

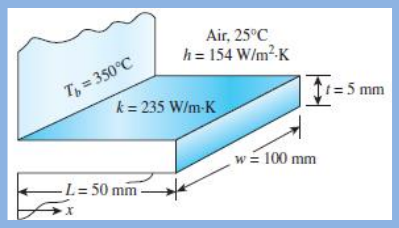
Course topics (Theory)	**Week**	**Learning Outcome**
Introduction to Heat Transfer Mechanisms	**1**	
Overview on Conduction Heat Transfer	**2-3**	
Composite Conduction Heat Transfer	**4-6**	
Fins analysis	**7-8**	
Shape Factor	**9**	
Numerical method for conduction heat transfer	**10-12**	
Practical Topics	**Week**	**Learning Outcome**
Calculation of Thermal conductivity of a metal bar	**1-4**	
Calculation of Heat Transfer Through composite wall	**5-8**	
Heat Transfer by radiation	**9-12**	

Questions Example Design

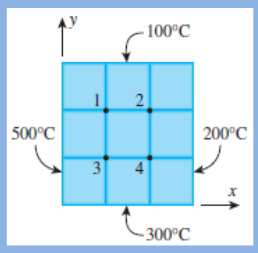
Theoretical:

Note: Answer all questions. Lecture notes, Data book and J. P Holman text book are allowed.

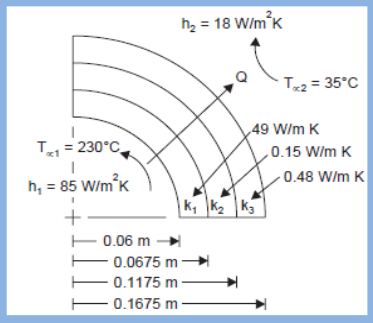
Q(1)(40 Marks):A plane wall with surface temperature of 350°C is attached with straight rectangular fins (k = 235W/m·K). The fins are exposed to an ambient air condition of 25°C and the convection heat transfer coefficient is 154 W/m^2.K. The fin has a length of 50 mm, a base of 5 mm thick and a width of 100 mm. Determine the efficiency and heat transfer rate.



Q(2)(30 Marks): Consider steady two-dimensional heat transfer in a square cross section (3 cm×3 cm) with the prescribed temperatures at the top, right, bottom, and left surfaces to be 100°C, 200°C, 300°C, and 500°C, respectively. Using a uniform mesh size D*x* = D*y*, determine the nodal temperatures.



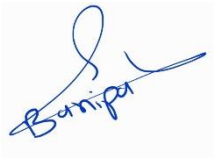
Q(3)(30Marks): A pipe carrying steam at 230°C has an internal diameter of 12 cm and the pipe thickness is 7.5 mm. The conductivity of the pipe material is 49 W/mK the convective heat transfer coefficient on the inside is 85 W/m2K. The pipe is insulated by two layers of insulation one of 5 cm thickness of conductivity 0.15 W/mK and over it another 5 cm thickness of conductivity 0.48 W/mK. The outside is exposed to air at 35°C with a convection coefficient of 18 W/m2K. Determine the heat loss for 5 m length. Determine the temperature at the first contact with the pipe.



Extra notes:

External Evaluator

I hereby confirm that I have reviewed the content of the course book and found it to be sufficient and covers the learning outcomes of this course.



Assist. Prof. Dr. Banipal Nanno Yaqob
17/9/2023