



Course Specification

DIPLOMA

Course Title: Heat Transfer

Course Code: APRT2208

Program: Renewable energy technologies

Department: Diploma Department

College: The Applied College

Institution: Umm Al-Qura University

Version: 1

Last Revision Date: 10 February 2025



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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (2nd Level / 1st Year)

4. Course General Description:

1. Course Description

- The course is prepared to provide the detailed understating of heat transfer principles. Topics include: Introduction and basic concepts of heat transfer - Introduction to conduction - One-dimensional steady-state conduction – Fins (extended surface) - Two-dimensional steady-state conduction – Numerical methods in steady-state conduction - Introduction to convection – Introduction to Heat exchangers - Radiation heat transfer.

5. Pre-requirements for this course (if any):

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

Course Main Objective

The main objectives of the course are to ensure that students are:

- Understand the modes of heat transfer and thermo-physical properties.
- Application of energy conservation equation for thermal problems.
- Calculate temperature and heat flux in one and two-dimensional conduction.
- Use the Finite Difference Method to solve steady-state heat conduction problems.
- Understand velocity and thermal boundary layers.
- Calculate heat transfer rate and effectiveness of different heat exchangers.
- Understand radiation properties and surfaces for heat transfer.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5	100%
2	E-learning		





No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	45
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the Heat transfer or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in Energy management and energy efficiency.	K1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories,	K2	Lectures, tutorials and independent study assignments	Homework, Quizzes,



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	research and professional practice in Heat transfer			Midterm and Exam
2.0	Skills			
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	S1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.2	Extracts from published research or professional reports in Heat transfer and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.	S2	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical	S5	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices in certain field of Heat transfer			
3.0	Values, autonomy, and responsibility			
3.1	Practice knowledge and skills to identify, independently and responsibly, the real problem by realizing a given problem statement in real selection of different Heat transfer systems , perform Literature Review to establish the need to solve the problem, define the real problem and develop technical objectives and a mission statement based on assumptions and realistic constraints to guide him to solve the problem.	V1	Study presentation and report preparation	Oral presentation and minor projects.
3.2	Communicate individual work well in written / oral form for diversified audience.	V2	Study presentation and report preparation	Oral presentation and minor projects.
3.3	Conduct professionally and perform research in his engineering discipline to write / publish a scholarly article.	V3	Study presentation and report preparation	Oral presentation and minor projects.

C. Course Content

No	List of Topics	Contact Hours
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1. 1	Introduction and basic concepts of heat transfer	2
2. 2	One-dimensional steady-state conduction	4
3	Fins	2
4	Two-dimensional, steady-state conduction	4
5	Numerical method in steady-state heat conduction	6
6	Introduction to convection	4
7	Introduction to Heat Exchangers	4
8	Radiation heat transfer	4
7	Lab Work	45
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1. 1	Quizzes and Exercise	3-8	%10
2. 2	Report & Presentation	3-8	%20
3. 3	Mid-term	9	%20
4	Final exam	17/18	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> FP Incropera and DP DeWitt, Fundamentals of Heat and Mass Transfer, 6th Edition, John Wiley, 2007. YA Cengel and AJ Ghajar, Heat and Mass Transfer: Fundamentals and Applications, 5th Edition. McGraw-Hil 2011. JP Holman, Heat Transfer, McGraw-Hill, 2009.
Supportive References	
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms





Items	Resources
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz, midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct analysis
The extent to which CLOs have been achieved	Program Coordinator	Direct analysis
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190394
DATE	22/11/1446

