هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Heat Transfer
Course Code:	323-MEC-3
Program:	Bachelor of Science in Engineering
Department:	Mechanical Engineering
College:	College of Engineering
Institution:	Najran University
Version:	1.0
Last Revision Date:	02/27/2024

Table of Contents

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: Fourth Year \ Level 7					
4. Course general Description:					
Modes of Heat Transfer: One Dimensional Conduction, Fourier's Law of Conduction, Thermal Conductivity of Solids, Liquids and Gases, General Conduction in Cartesian Coordinates, Heat Flow Through Plane Walls, Cylinders and Spheres, Critical Thickness of Insulation. Convection: Free and Forced Convection, Hydrodynamics and Thermal Boundary Layers, Equation of Momentum and Energy, Application of Dimensional Analysis, Drop Wise and Film Wise Condensation, Laminar Film on Vertical Surface. Radiation: Black Body Radiation, Emissive Power, Emissivity, Absorptivity, Gray, White and Back Bodies, Planck's Distribution Law, Kirchoff's Law, Wien's Displacement Law, Stefan Boltzman Law, Radiation Shape Factor. Boiling Heat Transfer, Pool Boiling Regimes, Heat Exchangers, Its Classification and Types. Overall Heat Transfer Coefficient, The NTU Method, Pressure Drop					
5. Pre-requirements for this course (if any)**:**					
221-MEC-3(Thermodynamics)					
6. Co-requisites for this course (if any)**:**					
NIL					
7. Course Main Objective(s):					
1. Differentiate between the different types of heat transfer in nature. 2. Interpret heat transfer in conduction and its general laws. 3. Illustrate heat convection with different conditions. 4. Identify heat transfer through radiation and differentiate between the black body and grey body radiations and its different fundamentals. 5. Demonstrate different types of heat exchangers, various stages of boiling of water and different means to remove its heat using heat exchangers.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • 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**	15
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Understanding various aspects of fundamentals of modes heat transfer i.e. conduction, convection and radiation.**	**1**	**TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each**	**-Test performance evaluation -Evaluation of participation in discussion and group assignments**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	
1.2	Developed the mathematical modeling and software for designing heat transfer equipment.	7	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Giving more assignment from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	-Test performance evaluation -Evaluation of participation in discussion and group assignments
...				
2.0	**Skills**			
2.1	To develop tests in the areas covered at different levels and	6	TS:1-Interactive lectures using PowerPoint slides	•Locally Developed Exams such as Quiz, Mid &

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	to produce test items in areas studied.		TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS: 5 – Discussion with the students in the class hours	Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
2.2	Retain the information by understanding the material and Decrease dependence on memorization	2	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS: 5 – Discussion with the students in the class hours	•Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
...				
3.0	**Values, autonomy, and responsibility**			
3.1	Participate in class discussions and take responsibility ethically in carrying	4	TS:1-Interactive lectures using PowerPoint slides	Locally Developed Exams such as Quiz, Mid &

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	out individual as well as group projects		TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
3.2	Have the necessary skills to communicate, listen, negotiate, and evaluate their strengths and weaknesses as members of a team.	1	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam from each chapter TS:5 – Giving more example programs in the lecture	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			TS: 6 – Discussion with the students in the class hours	
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Principles of Heat Transfer.	10
2.	Steady state and transient conduction in different co-ordinates, extended surfaces	10
3.	Convective heat transfer	10
4.	Analysis and empirical relations for forced and natural convection	10
5.	Radiation heat transfer, radiation exchange between black and gray surfaces	8
6.	Heat transfer applications (Heat Exchangers).	6
7.	Numerical methods in heat transfer with computer applications	6
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-10	10%
2.	Quizzes	1-10	10%
3.	Mid-term	4 & 8	20%
4.	labs	1-10	10%
5.	Final exam	15	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	Heat Transfer by J. P. Holman, 10 th edition, McGraw-Hill Companies edition , 2017.
Supportive References	1.Fundamentals of Engineering Heat & Mass Transfer by R. C. Sachdeva, New Age Science Publishers (2009)

	2. Heat And Mass Transfer Fundamentals and Applications, Yunus Cengel and Afshin Ghajar, 5 th edition, 2014.
Electronic Materials	**Online custom books**
Other Learning Materials	**NA**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classrooms and laboratories**
Technology equipment (projector, smart board, software)	--
Other equipment (depending on the nature of the specialty)	--

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders and Peer Reviewer	Direct, Indirect
Effectiveness of Students assessment	Students & Faculty	Direct and Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT OF MECHANICAL ENGINEERING**
REFERENCE NO.	
DATE	**02/27/2024**