Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions** **Hours per Week**			**Credits**			
5MERC3 **HEAT TRANSFER**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hrs							

Course Objective:

The course is designed

1. To make a fundamentally strong base theory of heat transfer.
2. To understand different modes of heat transfer.
3. To model and simulate heat transfer phemenon.
4. To extend the theory of heat transfer equipment.

Prerequisite(s): Fluid Mechanics, Engineering Thermodynamics, Applied Mathematics.

COURSE CONTENTS

UNIT- I

Steady State Heat Conduction: One Dimensional Heat Conduction Equation, General Heat Conduction Equation, Heat Conduction in Cylinders and Spheres, Heat generation in Plane wall and cylinders, Variable Thermal Conductivity, Thermal Contact Resistance, Illustrative Problems

UNIT- II

Heat Transfer from Extended Surfaces and Transient Heat Conduction: Steady flow of heat along a rod, Governing differential equations and its solutions, Heat dissipation from infinitely long fin, Heat dissipation from fin having insulated tip, Fin performance, Critical Radius of Insulation, Lumped System Analysis, Transient Heat Conduction in Large Plane Walls and Long Cylinders, Illustrative Problems

UNIT- III

Fundamentals of Convection: Physical Mechanism on Convection, Velocity Boundary Layer and Thermal Boundary Layer , Derivation of Differential Convection Equation, Natural Convection over Surfaces, Natural Convection from Finned Surfaces and PCBs, Forced Convection across Cylinders, Spheres and Tube Banks, Combined Natural and Forced Convection.

UNIT-IV

Fundamentals of Thermal Radiation: Introduction, Radiative Properties, View Factor Relations, Radiation Heat Transfer, Radiation Shields and the Radiation Effects.

UNIT- V

Heat Exchangers: Classification of Heat Exchangers, Nature of Heat Exchange process, Mechanical design of heat exchange surfaces, Performance analysis, Overall heat Transfer Coefficient, Effectiveness-NTU method, Cooling of Electronic Equipments, Illustrative Problems.

Course Outcome:

Students earned credits will develop ability to

CO1 List and Tabulate the Temperature Measuring Devices.
CO2 Determine the thermal conductivity of an insulating powder.
CO3 Calculate the overall heat transfer coefficient and intermediate temperatures in Composite Wall Apparatus
CO4 Effectiveness and efficiency of pin fin by using pin fin apparatus
CO5 Determine and verify the value of Stefan Boltzmann constant experimentally..
CO6 Determine the effectiveness and overall heat transfer coefficient of Parallel and Counterflow type Heat Exchanger.
CO7 Determine the effectiveness and overall heat transfer coefficient of Shell and tube type Heat Exchanger

BOOKS RECOMMENDED

[1] Cengel YA.,*Heat Transfer-A Practical Approach*, Tata McGraw Hill, New Delhi 2e,2002.
[2] Rudramoorthy R. *Heat Transfer-Theory and Problems* ,Pearson Education, New Delhi, 2006
[3] Christopher A, *Essential Heat Transfer*, Pearson Education, New Delhi, 2001.
[4] Nag,P.K., *Heat Transfer*, Tata McGraw Hill, New Delhi, 1e , 2006.

List of Practical Assignments:

1. List and Tabulate the Temperature Measuring Devices
2. To determine the thermal conductivity of an insulating powder
3. To Calculate the overall heat transfer coefficient and intermediate temperatures in Composite Wall Apparatus
4. To determine the Effectiveness and efficiency of pin fin by using pin fin apparatus
5. To Determine and verify the value of Stefan Boltzmann constant experimentally
6. Determining the effectiveness and overall heat transfer coefficient of Parallel and Counter flow type Heat Exchanger
7. Determining the effectiveness and overall heat transfer coefficient of Shell and tube type Heat Exchanger.

Course Objective:

The course is designed

1. To make a fundamentally strong base theory of heat transfer.
2. To understand different modes of heat transfer.
3. To model and simulate heat transfer phemenon.
4. To extend the theory of heat transfer equipment.

Course Outcome:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	List and Tabulate the Temperature Measuring Devices.	PO1,PO3
CO2	Determine the thermal conductivity of an insulating powder.	PO1,PO3,PO4
CO3	Calculate the overall heat transfer coefficient and intermediate temperatures in Composite Wall Apparatus.	PO1,PO5,PO6
CO4	Effectiveness and efficiency of pin fin by using pin fin apparatus	PO1,PO3
CO5	Determine and verify the value of Stefan Boltzmann constant experimentally.	PO1,PO4,PO12
CO6	Determine the effectiveness and overall heat transfer coefficient of Parallel and Counterflow type Heat Exchanger.	PO1,PO5,PO12
CO7	Determine the effectiveness and overall heat transfer coefficient of Shell and tube type Heat Exchanger.	PO1,PO2,PO4,PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3		3									
CO2	3		3	3								
CO3	3				3	3						
CO4	3			3								2
CO5	3				3							2
CO6	3				3							2
CO7	3	2		3								2

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)

1→ relevant and small significance 2 → medium or moderate and 3 →strong