Devi Ahilya Vishwavidyalaya, Indore, India Institute of Engineering & Technology				**III Year B.Tech. (Mechanical) (Full Time)**		
Course Code & Name	**Instruction Hours per semester and Credits**					
5RMPC3 HEAT TRANSFER	**Classroom Instruction (CI)**	**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**	**120**	**4**
	20	**10**	**20**	**70**		

Learning Objectives

The course is designed:

1. To understand the fundamental modes of heat transfer and their governing equations.
2. To analyze steady and transient heat conduction problems in various geometries.
3. To study the mechanisms of convection heat transfer for different flow conditions.
4. To understand the concepts of thermal radiation and view factors.
5. To evaluate the performance of heat exchangers and their practical applications.

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.

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 Counterflow type Heat Exchanger
7. Determining 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] Holman J. Heat Transfer-,McGrawHill, New Delhi, 2006
[3] Incropera F., and DeWitt D, Fundamentals of Heat And Mass Transfer, Pearson Education, New Delhi, 2001.
[4] Thirumaleshwar M., Fundamentals of Heat and Mass Transfer, Pearson Education, New Delhi, 1e , 2006.

Course Outcomes (COs)

CO .	After completion of the course, students will be able to:
CO1	Derive and apply one-dimensional steady-state and transient heat conduction equations to plane walls, cylinders, and spheres.
CO2	Analyze heat transfer through extended surfaces (fins) and evaluate fin performance and transient heat conduction.
CO3	Apply the principles of convection to determine heat transfer coefficients for forced and natural convection systems.
CO4	Understand and analyze thermal radiation, emissivity, and view factor concepts in radiative heat transfer.
CO5	Evaluate and design heat exchangers using LMTD and effectiveness–NTU methods for various engineering applications.

CO–PO–PSO Mapping

(COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	0	1	0	0	0	0	0	0	2	3	2	0
CO2	3	3	2	2	0	0	0	0	0	0	2	3	2	0
CO3	3	3	0	2	0	0	0	0	0	0	2	3	2	0
CO4	3	2	0	0	0	0	0	0	0	0	2	3	2	1
CO5	3	3	3	2	1	2	-0	-0	-0	2	2	3	3	1