

Samrat Ashok Technological Institute, Vidisha

Department of Mechanical Engineering

Lecture Plan

Course Code:	ME-1851	Year/Semester :	B. Tech. 3 rd year/5 th Sem
Course Name:	Heat and Mass Transfer	Academic Year :	August-Dec. 2023 / ODD Sem
L – T– P:	3 – 1– 2	Credit :	4
Course Detail :	Theory and Practical	Term Start Date :	24.07.2023
Course Coordinator:	Dr. Mangal Singh Lodhi	Term End Date :	-
Contract hours per week :	4	Total number of hours:	40

Sr. No.	Units/Topics	Course contents/Subtopic	Hours allotted	Actual date	Teaching aid code	Remarks
01	Basic Concepts	Modes of heat transfer, Fourier's law, Newton's law, Stefan Boltzman law	1			
		Thermal resistance and conductance, Analogy between flow of heat and electricity	1			
	Steady State Conduction	Derivation of Fourier heat conduction equation, its forms in rectangular, cylindrical and spherical coordinates	2			
		Linear one dimensional steady state conduction through a slab, tubes, spherical shells	2			
		Critical thickness of insulation for pipes, effect of variable thermal conductivity	2			
02	Extended Surfaces (Fins)	Heat transfer from a straight and annular fin (plate) for a uniform cross section	1			
		Error in measurement of temperature in a thermometer well	2			
		Fin efficiency, fin effectiveness, applications of fin	1			
	Unsteady Heat Conduction	Transient and periodic conduction, Heating and cooling of bodies with known temperatures distribution	2			
		Systems with infinite thermal conductivity, response of thermocouples	2			
03	Convection	Introduction, free and forced convection	1			
		Principle of dimensional analysis, Buckingham 'pie' theorem	2			
		Application of dimensional analysis of free and forced convection	1			
		Empirical correlations for laminar and turbulent flow over flat plate & tubular geometry	2			
		Calculation of convective heat transfer coefficient using data book	2			
04	Heat Exchangers	Types: Parallel flow, counter flow; evaporator and condensers, Overall heat transfers coefficient, fouling factors	2			
		Method of heat exchanger analysis, LMTD method	2			
		Effectiveness of heat exchanger, NTU method	2			
	Mass transfer	Fick's law, equi-molar diffusion, diffusion coefficient	1			
		Analogy with heat transfer, diffusion of vapour in a stationary medium	1			
05	Thermal Radiation	Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Laws of thermal radiation	2			
		Radiation from real surfaces, Radiation heat exchange between black and gray surfaces	2			
		Shape factor, analogical electrical network, radiation shields	2			
	Boiling and Condensation	Film wise and drop wise condensation; Nusselt theory for film wise condensation on a vertical plate	1			
		Boiling heat transfer phenomenon, regimes of boiling, boiling correlations	1			

Teaching aid code:	
1.	White Board
2.	LCD/Overheaded Projector
3.	Model/ Charts
4.	Powerpoint Presentation/ Video
Lesson Planning, Revision no. 01	

Signature of Teacher: 

Reference/Text Books:

1. SOM SK; Introduction to Heat Transfer; PHI
2. Dewitt Incropera, Fundamentals of Heat and Mass Transfer; Wiley
3. Sachdeva RC; Fundamentals of Engineering Heat and Mass Transfer; New Age
4. Holman JP; Heat transfer; TMH
5. Sukhatme SP; Heat and Mass Transfer; University Press Hyderabad
6. Kumar DS; Heat and Mass Transfer; SK Kataria and Sons Delhi