




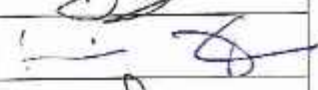


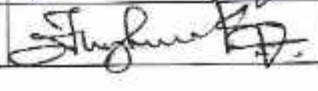
LESSON PLAN

Course Code	Course Title	Semester	Branch	Contact Periods /Week	Academic Year	Date of commencement of Semester
20ME6T02	HEAT TRANSFER	VI	ME	5	2024-25	18-11-24
COURSE OUTCOMES						
CO1	Describe modes of heat transfer and solve one-dimensional heat conduction problems without and with heat generation.[K3]					
CO 2	Develop heat transfer relations for different fin configurations and solve one dimensional transient heat conduction problems.[K3]					
CO 3	Apply different correlations developed for estimation of forced and natural convection heat transfer					
CO 4	Describe various regimes of boiling and types of condensation heat transfer and also analyze different heat exchangers.[K4]					
CO 5	State and apply laws of radiation and estimate radiation heat transfer between bodies [K3]					
UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
I	CO1: Describe modes of heat transfer and solve one-dimensional heat conduction problems without and with heat generation.[K3]	INTRODUCTION TO HEAT TRANSFER AND CONDUCTION				
		1.1	Basic modes of heat transfer, laws of heat transfer	T1,T2	1	Chalk & Talk, PPT Videos and Active learning
		1.2	Multi-mode heat transfer-simple problems	T4,R2	1	
		1.3	General conduction equation in Cartesian coordinates	T1,T2	1	
		1.4	General conduction equation in cylindrical coordinates	T1,T2	1	
		1.5	General conduction equation in spherical coordinates	T1,T2	1	
		1.6	Initial and boundary conditions.	T1,T2	1	
		1.7	One dimensional conduction heat transfer without heat generation in plane, composite planes, cylinder and composite cylinders.	T1,T3	1	
		1.8	One dimensional conduction heat transfer with heat generation in plane and cylinder.	T1,T3	2	
		1.9	Thermal contact resistance, Overall heat transfer coefficient.	T1,T3	1	
		1.10	Conduction shape factor.	T3,R3	1	
		1.11.	Problems	T1,T3,R2	2	
		1.12	One dimensional conduction heat transfer without heat generation in sphere (Beyond syllabus)	T1,T3	1	
Total					14	

		CONDUCTION AND CONVECTION SYSTEMS				
II	CO2: Develop heat transfer relations for different fin	2.1	Extended surface (fins) Heat Transfer –types	T1,T3	1	Chalk & Talk, PPT Videos
		2.2	General fin heat transfer equation for long Fin	T1,T3	1	
		2.3	General fin heat transfer equation for fin with insulated tip.	T1,T3	1	
		2.4	General fin heat transfer equation Short Fin,	T1,T3	1	
		2.5	Fin effectiveness, Fin efficiency	T1,T3	1	
		2.6	problems	T1,T3,R2	1	
		2.7	Systems with negligible internal resistance,	T1,T2	1	
		2.8	Significance of Biot and Fourier Numbers,	T1,T2	1	
		2.9	Chart solutions of transient conduction systems.	T1,T3	1	
		2.10	Problems	T1,T3,R2	2	
		2.11	(Beyond syllabus) Semi – infinite body and finite bodies of cylinders and cubes.	T1,T3	1	
III	CO3: Apply different correlations developed for estimation of forced and natural convection heat transfer. [K3]	CONVECTIVE HEAT TRANSFER:				
		3.1	Classification of convective heat transfer,	T1,T2,T4	1	Chalk & Talk, PPT Videos and Active learning
		3.2	Dimensional analysis – Buckingham Pi Theorem for forced and free convection,	T1,T2,T4	1	
		3.3	Significance of non-dimensional numbers,	T1,T2,T4	1	
		3.4	differential mass, momentum and energy equations of laminar boundary layer on a flat Plate,	T1,T2,T4	1	
		3.5	Reynold's and Colburn analogy,	T1,T2	1	
		3.6	Empirical relations of laminar and turbulent flows over geometries of different shapes.	T1,T2,T4	1	
		3.7	Flow through pipes: Concepts about hydrodynamic and thermal entry lengths	T1,T2,T4	1	
		3.8	Use of empirical relations for horizontal pipe flow and annulus flow.	T1,T2,T4	1	
		3.9	Natural convection heat transfer- Laminar Free Convection on a vertical surface, effects of turbulence,	T1,T2,T4	1	
		3.10	Empirical correlations -Vertical Plate, Inclined and Horizontal Plates, long Horizontal Cylinder, Spheres.	T1,T2,T4	1	
		3.11	Problems	T1,T2,R1	2	

					12	
IV	types of condens ation heat	Boiling and Condensation & Heat Exchangers				Chalk & Talk, PPT Videos
		4.1	Boiling– types of boiling, Pool boiling, different regimes of pool boiling.	T1,T2	1	
		4.2	Empirical relation for heat flux in nucleate boiling, maximum or critical heat flux and Leiden frost point, applications of boiling	T1,T2	1	
		4.3	Film wise and drop wise condensation, applications of condensation	T1,T2	1	
		4.4	Nusselt theory of film condensation	T1,T2	1	
		4.5	Problems on boiling	T1,T2,R1	1	
		4.6	Problems on condensation.	T1,T2,R1	1	
		Heat Exchangers				
		4.7	Applications, types of heat exchanger	T1,T2	1	
		4.8	Heat exchanger analysis - LMTD method	T1,T2	1	
		4.9	Effectiveness- NTU method	T1,T2	2	
		4.10	Cross flow heat exchanger, Shell and tube heat exchanger.	T1,T2	1	
		4.11	Problems	T1,T2,R1	2	
		4.12	(Beyond syllabus) Fouling of Heat exchanger		1	
Total				14		
V	CO5: State and apply laws of radiation and estimate radiation heat transfer between bodies. [K.3]	5 Radiation Heat Transfer				Chalk & Talk, PPT &Videos
		5.1	Plank's theory of radiation, Surface, surface emission properties,	T1,T4,R3	1	
		5.2	Emissivity, Absorbvity, Reflectivity and transmissivity, Concept of Black body	T1,T4,R3	1	
		5.3	Stefan – Boltzmann's law of radiation, Kirchoff's law,	T1,T4,R3	1	
		5.4	Planck's law and Wein's displacement law,	T1,T4,R3	1	
		5.5	Intensity od radiation and Lambert cosine law	T1,T4,R3	1	
		5.6	Radiation heat transfer between black bodies, Shape factor algebra	T1,T4,R3	2	
		5.7	Radiation heat transfer between infinite and finite surfaces,	T1,T4,R3	1	
		5.8	Radiation shields.	T1,T4,R3	1	
		5.9	Problems	T1,T2,R1	2	
		5.10	(Beyond syllabus) Radiation from Gasses and Vapours	T1,T2,R1	1	
Total				12		
CUMULATIVE PROPOSED PERIODS				64		

Text Books:	
S.No	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
T1	R. C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, 6 th edition, New Age Internationals, 2022
T2	R K Rajput, Heat and Mass Transfer, Revised 7 th Edition, S Chand- 2018
T3	D.S. Kumar, Heat Transfer, 8 th Edition, S. K. Kataria, & Sons, 2015.
T4	J. P. Holman, Heat Transfer, 10 th Edition, Tata McGraw-Hill publishing Company Limited, 2017.
Reference Books:	
R1	Yunus A. Cengel Heat and Mass Transfer - Fundamentals and Applications, 6th Edition, McGraw Hill Education, 5 August 2020
R2	P. K. Nag, Heat and Mass Transfer, 3 rd Edition, Tata McGraw-Hill Education, 2011.
R3	S. C Arora, S. Domkundwar and Anand V. Domkundwar, Heat and Mass Transfer, 2 nd Edition, , Dhanpat Rai & co, 2007.
Web Details	
1	https://nptel.ac.in/courses/112101097
2	https://www.youtube.com/watch?v=qa-PQOjS3zA
3	https://www.youtube.com/watch?v=jc_hL_tSFzo
4	https://www.youtube.com/watch?v=6OGnB9tywtI
5	https://www.youtube.com/watch?v=CDncSyDvpdQ

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