



SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous) .

Narsapur, West Godavari District, A.P. 534280

DEPARTMENT OF MECHANICAL ENGINEERING

TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
23ME6T01	HEAT TRANSFER	VI	ME	6	2025-26	10-12-25

COURSE OUTCOMES

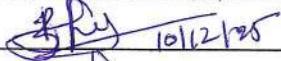
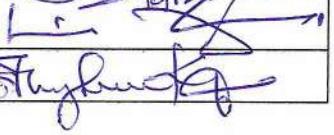
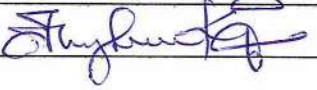
CO1	Describe the fundamental modes and laws of heat transfer.[K3]
CO 2	Solve one-dimensional conduction problems in various geometries.[K3]
CO 3	Apply convective heat transfer principles to external and internal flows.[K3]
CO 4	Examine the rate of heat transfer with phase change.[K3]
CO 5	Analyze performance of heat exchangers.[K4]
CO 6	Determine radiation heat transfer between surfaces and apply shape factor concepts.[K3]

UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
I	CO1: Describe the fundamental modes and laws of heat transfer.	Introduction, Conduction Heat Transfer, One Dimensional Steady State Conduction Heat Transfer				
		1.1	General discussion about applications of heat transfer, Basic modes of heat transfer,	T1,T2	1	Chalk & Talk, PPT Videos and Active learning (Role play)
		1.2	Laws of heat transfer	T1,T2	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	Steady, unsteady and periodic heat transfer, Initial and boundary conditions.	T1,T3	1	
		1.7	One dimensional conduction heat transfer without heat generation in plane, composite planes, cylinder and composite cylinders.	T1,T3	1	
		1.8	Overall heat transfer coefficient, Electrical analogy – Critical radius of insulation. Variable Thermal conductivity	T1,T3	1	
		1.9	One dimensional conduction heat transfer with heat generation in plane and cylinder.	T3,R3	1	
		1.10	Extended surface (fins) Heat Transfer –types, General fin heat transfer equation for long Fin	T1,T3,R2	1	
		1.11.	General fin heat transfer equation for fin with insulated tip, General fin heat transfer equation Short Fin,	T1,T3	1	
		1.12	Fin effectiveness, Fin efficiency	T1,T3,R2	1	
		1.13	Problems		3	
					15	

II	Solve one-dimensional conduction problems in various geometries.[K3]	2.1	Systems with negligible internal resistance , Lumped heat analysis	T1,T2	1	Chalk & Talk, PPT Videos and Active learning (Think-pair-share)	
		2.2	Significance of Biot and Fourier Numbers,	T1,T3	1		
		2.3	Chart solutions of transient conduction systems.	T1,T2	1		
		2.4	Concept of Semi-infinite body.	T1,T3,R2	1		
		2.5	Problems	T1,T2	3		
		2.6	Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow	T1,T2	1		
		2.7	Dimensional analysis as a tool for experimental investigation – Buckingham π Theorem and method	T1,T2	1		
		2.8	application for developing semi – empirical non- dimensional correlation for convection heat transfer	T1,T3	1		
		2.9	Significance of non-dimensional numbers – Concepts of Continuity	T1,T3	1		
		2.10	Concepts of Momentum and Energy Equations	T1,T3	1		
		2.11	(Beyond syllabus) Semi – infinite body and finite bodies of cylinders and cubes.		1		
		Total		13			
III	Apply convective heat transfer principles to external and internal flows.[K3]	Forced convection: External Flows:					
		3.1	Concepts about hydrodynamic boundary layer and thermal boundary layer	T1,T2,T4	1	Chalk & Talk, PPT Videos and Active learning (Think-pair-share)	
		3.2	Use of empirical correlations for convective heat transfer -Flat plates	T1,T2,T4	1		
		3.3	Use of empirical correlations for convective heat transfer - Cylinders.	T1,T2,T4	1		
		3.4	Problems on external flows	T1,T2,T4	2		
		3.5	Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths	T1,T2	1		
		3.6	Division of internal flow based on this – Use of empirical relations for Horizontal Pipe Flow and annulus flow.	T1,T2,T4	1		
		3.7	Problems on internal flow	T1,T2,T4	2		
		3.8	Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate -	T1,T2,T4	1		
		3.9	Use of empirical relations for Vertical plates and pipes.	T1,T2,T4	1		
		3.10	Problems	T1,T2,R1	2		
		13					

IV		Heat Transfer with Phase Change Boiling:& Condensation and Heat Exchangers		
Examine the rate of heat transfer with phase change.[K3] Analyze performance of heat exchangers.[K4]		4.1 Boiling: Pool boiling Regimes Calculations on Nucleate boiling,	T1,T2	1
		4.2 Critical Heat flux and Film boiling	T1,T2	1
		4.3 Condensation: Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate	T1,T2	1
		4.4 Film condensation on vertical and horizontal cylinders using empirical correlations.	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, Classification of heat exchanger, overall heat transfer Coefficient and fouling factor	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
Total				13
5 Radiation Heat Transfer				
V		5.1 Emission characteristics and laws of black-body radiation	T1,T4,R3	1
		5.2 Emissivity, Absorptivity, Reflectivity and transmissivity, Concept of Black body, Irradiation – total and monochromatic quantities	T1,T4,R3	1
		5.3 Planck's law and Wein's displacement law and Kirchhoff law	T1,T4,R3	1
		5.4 Stefan – Boltzmann's law of radiation and Lambert cosine law	T1,T4,R3	1
		5.5 Intensity of radiation	T1,T4,R3	1
		5.6 Radiation heat transfer between black bodies	T1,T4,R3	1
		5.7 Concept of Shape factor	T1,T4,R3	1
		5.8 Emissivity, Radiation heat transfer between gray bodies	T1,T4,R3	1
		5.9 Radiation shields, electrical analogy for radiation networks	T1,T4,R3	1
		5.9 Problems	T1,T2,R1	3
Total				12
CUMULATIVE PROPOSED PERIODS				66
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_tFz0
4	https://www.youtube.com/watch?v=6OGnB9tywtI
5	https://www.youtube.com/watch?v=CDncSyDvpdQ

		Name	Signature with date
i.	Faculty	Mr. B. SRINIVAS	 10/12/20
ii.	Course Coordinator	Mr. B. SRINIVAS	 10/12/20
iii.	Module Coordinator	Dr. .R. LALITHA NARAYANA	 10/12/20
iv.	Program Coordinator	Dr. M. FRANCIS LUTHER KING	 10/12/20




Principal