GUJARAT TECHNOLOGICAL UNIVERSITY
AERONAUTICAL ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Theory of Heat Transfer**
Subject Code: **170102**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	Fourier's law of heat conduction, effect of temperature on thermal conductivity of metals, refractory and building materials, liquid and gases, derivation of generalized equation in Cartesian coordinates and its reduction to specific cases, three dimensional heat conduction equations in cylindrical and spherical co-ordinates One dimensional steady state conduction, heat conduction through plane and composite walls, hollow and composite cylinders, hollow and composite spheres, electrical analogy, overall heat transfer coefficient Critical thickness of insulation, transient heat conduction- lumped heat capacity analysis	8
2.	Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip, efficiency and effectiveness of fin, Biot number, Estimation of error in temperature measurement in a thermometer well.	5
3.	Dimensional analysis applied to forced and free convection, dimensionless numbers and their physical significance, empirical correlations for free and forced convection	4
4.	Continuity, momentum and energy equations, thermal and hydrodynamic boundary layer, blasius solution for laminar boundary layer, Von-Karman integral momentum equation.	6
5.	Absorptivity, reflectivity and transmissivity, black, white and grey body, emissive power and emissivity, laws of radiation – Planck, Stefan-Boltzmann, Wein's displacement, Kirchoff, intensity of radiation and solid angle, Lambert's cosine law.	10

	Radiation heat exchange between black bodies, shape factor, heat exchange between non-black bodies- infinite parallel planes and infinite long concentric cylinders, radiation shield, heat exchange between two grey surfaces, electrical analogy.	
6.	Types, heat exchanger analysis, LMTD for parallel and counter flow exchanger, condenser and evaporator, overall heat transfer coefficient, fouling factor, correction factors for multi pass arrangement, effectiveness and number of transfer unit for parallel and counter flow heat exchanger, introduction to heat pipe, compact heat exchangers	7
7.	Boiling regimes, bubble growth, nucleate boiling, critical heat flux, film pool boiling, forced convection boiling . Film wise and drop wise condensation, laminar film condensation on vertical plate, turbulent film condensation, film condensation on tubes.	5

Text Books:

1. Heat & Mass Transfer by R.K. Rajput, S. Chand & Co. New Delhi.
2. Heat & Mass Transfer by R. C. Sachdeva, New Age International, New Delhi

Reference Books:

1. Heat & Mass Transfer by P.K. Nag, Tata McGraw Hill, New Delhi.
2. Heat & Mass Transfer by Arora & Domkundwar, Dhanpat rai and Co., NewDelhi
3. Heat & Mass Transfer by Mills and Ganesan, Pearson Publication, New Delhi
4. Engineering Heat & Mass Transfer by M.M. Rathore, Laxmi Prakshan
5. Heat & mass transfer by by D.S. Kumar, S.K. Kataria & Sons
6. Heat transfer by B.L. Singhal, Techmax, publication, Pune
7. Heat transfer by Dr. A.S. Padalkar, Nirali Prakashan, Pune.