HEAT TRANSFER FOR AERONAUTICAL ENGINEERING

PROFESSIONAL ELECTIVE - V

VIII Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5AE55	PCC	3	0	0	3	30	70	100

COURSE OBJECTIVES:

1. Understand heat transfer fundamentals, and apply them to engineering problem solving
2. Understand and practice heat transfer measurements in laboratories, and compare measurements with theories.
3. Use Excel for data analyses and engineering plots, and use Word for technical report writing
4. Consider experimental design issues for heat transfer laboratories

UNIT-I **INTRODUCTION**

Introduction: Modes and mechanisms of heat transfer, Basic laws of heat transfer, Applications of heat transfer. Fourier rate equation , general heat conduction equations in Cartesian, Cylindrical and Spherical coordinates. Different forms of the field equation, steady, unsteady and periodic heat transfer – Initial and boundary conditions

UNIT-II **ONE DIMENSIONAL STEADY STATE HEAT CONDUCTION**

One dimensional steady state heat conduction: Homogeneous slabs, hollow cylinders and spheres, Overall heat transfer coefficient, Extended surfaces (Fins), Long, Short and insulated tips.

UNIT-III **CONVECTIVE HEAT TRANSFER**

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration Πof flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Theorem and method, application for developing semi – empirical non-dimensional correlation for convection heat transfer

UNIT-IV **FREE CONVECTION & HEAT EXCHANGERS**

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor

UNIT-V **RADIATION HEAT TRANSFER**

Radiation Heat Transfer : Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks

Text Books:

1. Yunus A. Cengel (2012), Heat Transfer a Practical Approach, 4th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. R. C. Sachdeva (2012), Fundamentals of Engineering, Heat and Man Transfer, 3rd edition, New Age, New Delhi, India.

Reference Books:

1. Holman (2012), Heat Transfer (SI Units), 10th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

2. P. S. Ghoshdastidar (2012), Heat Transfer, 2nd edition, Oxford University Press, New Delhi, India.

3. Incropera, Dewitt (2012), Fundamentals of Heat Transfer, 6th edition, John Wiley, UK.

COURSE OUTCOMES:

1. Students are able to model the given heat transfer problem mathematically, categorize the heat transfer problems
2. Students are able to derive the equation for temperature distribution in fins, to estimate the rate of heat transfer through conduction through slabs, cylindrical and spherical surface objects.
3. Students are capable to design the thickness of insulation based on the requirement of heat transfer
4. Students are able to estimate the rate of heat transfer heat transfer coefficients for forced and free convection Heat transfer problems
5. Students are able to perform the LMTD & NTU analysis to the heat exchanger problems, to analyze and design the boiling heat transfer problems