10 ME 323 HEAT TRANSFER (SI UNITS)
III B.Tech II Semester
(with effect from the academic year 2012-2013)

Lectures/week: 3 Hrs. *Credits: 4*
University Exam:3 Hrs *Sessional Marks: 40*
End Examination Marks: 60

UNIT- I

Introduction: Definition of heat- Modes of Heat Transfer- Basic Laws of heat transfer- Electrical Analogy of heat conduction- Conduction through composite walls- Overall heat transfer coefficient.

Conduction without heat generation: The General heat Conduction equation in Cartesian- cylindrical and spherical coordinates-1D- 2D- 3D- steady heat conduction without internal heat generation- the plane slab- the cylindrical shell- the spherical shell- Critical thickness of insulation.

UNIT- II

Conduction with heat generation: Variable thermal conductivity- Steady heat conduction with uniform internal heat generation- the plane slab;- cylindrical and spherical systems.

Fins: Fins of uniform cross-section- Governing equation- Temperature distribution and heat dissipation rate- Efficiency and effectiveness of fins.

UNIT- III

Convection: Free and forced convection- Newton's law of cooling; convective heat transfer Coefficient- Dimensionless numbers- Reynolds Number, Prandtl Number, Nusselt Number, Grashoff Number and Stanton Number and their significance.

Analysis of forced convection- Analytical solution to forced convection problems- the concept of boundary layer- hydrodynamic and thermal boundary layer- Momentum and Energy equations for boundary layer- Exact solution for laminar flow over a flat plate - The integral approach- integral momentum and energy equations- solution of forced convection over a flat plate using the integral method.

Analysis of free convection- Free convection heat transfer on a vertical flat plate - Relation between fluid friction and heat transfer- Reynolds analogy-

UNIT- IV

Radiation: Theories of thermal radiation- Absorption- reflection and transmission- Monochromatic and total emissive power- Black body concept- Planck's distribution law- Stefan Boltzmann law- Wien's displacement law- Lambert's cosine law- Kirchhoff's law- Shape factor- Heat Transfer between black surfaces.

UNIT- V

Heat Exchangers: Introduction; classification of heat exchangers- Logarithmic mean temperature Difference- Area calculation for parallel and counter flow heat exchangers- Effectiveness of heat exchangers- NTU method of heat exchanger design- Applications of heat exchangers.

TEXT BOOKS:

1. Heat Transfer : J.P. Holman.
2. Fundamentals of Engineering Heat & Mass Transfer : Sachadeva R.C
3. Heat and Mass Transfer : D S Kumar

REFERENCES:

1. Heat transfer : Domukundwar
3. Principles of heat transfer : Frank kreith