

## HEAT EXCHANGER ANALYSIS & DESIGN

Constructional Details: Types, Fluid flow arrangements, parallel, Counter and Cross flow, shell and tube heat exchanger, Regenerators and recuperator. Condensers – Industrial applications. ; Heat Transfer: Modes of Heat Transfer, Overall heat transfer coefficient, Thermal resistance, Efficiency. Temperature Distribution and its implications, LMTD, effectiveness; Flow Distribution: Effect of Turbulence, Friction Factor, Pressure Loss, Orifice, Flow nozzle, Diffusers, Bends, Baffles, Effect of Channel Divergence, Manifolds.; Stress in tubes, Headers sets and Pressure vessels: Differential Thermal Expansion, Thermal stresses, Shear stresses, Thermal sleeves, Vibration, Noise, types of failures. ; Design Aspects: Heat transfer and pressure loss flow configuration effect of baffles. Effect of deviations from ideality. Design of typical liquid-liquid, gas-gas-liquid heat exchangers. Design of cooling towers.

### Essential Reading:

1. W.M. Kays and A.L. London., Compact Heat Exchangers', 3rd Ed., TMH,1984.
2. A.P. Frass and M.N.Ozisik, Heat Exchanger Design', John Wiley & Sons Inc, 1965.
3. G.Walker, Industrial Heat Exchangers', A basic guide, TMH V Book Co., 1980.

### Supplementary Reading:

1. 'Standards of the Tubular Exchanger Manufacturer Association', 6th Ed., Tubular Exchanger Manufacturers Association, New York, 1978.
2. D. Q. Kern, Process Heat Transfer', McGraw Hill Book Co., 1984.
3. E.A.D. Saunders., Heat Exchangers', Longman Scientific and Technical, New Delhi