

HEAT TRANSFER EQUIPMENTS

Laws of conduction, convection and radiation; solution for some ideal geometries, Heat flow paths in series and parallel. Insulation systems – solid, foam, fiber, powder, vacuum and multilayer insulation. Design of insulation systems. ; Conductive heat flow devices – fins, heat sinks etc.; Convective heat transfer and flow friction phenomena co-relations. Heat exchangers – their classification based on flow direction and construction geometry. Design of Shell & Tube, Plate fin, Matrix and other types of heat exchangers; use of TEMA codes. Design of heat exchangers for automotive, refrigeration, cryogenic and chemical process plants. Heat exchangers with phase change. ; Regenerative heat exchangers – dual regenerators as continuous heat exchangers, single regenerators in cryogenic devices. ; Radiation coolers, heat transfer in vacuum; cryopumps – their structure and design; cryogenic storage vessels – their structure and insulation system design.

Essential Reading(s):

1. R. K. Shah & D. P. Sekulic, Fundamentals of Heat Exchanger Design, John Wiley, 2003.
2. E. M. Smith Advances in Thermal Design of Heat Exchangers, John Wiley, 2005.

Supplementary Reading:

1. E. Hesselgreaves, Compact Heat Exchangers, Elsevier, 2001.
2. R.F. Barron, Cryogenic Systems, McGraw Hill, 1985.