



MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Mechanical Engineering

Course Hand-out

Heat and Mass Transfer | ME 1507 | 4 Credits | 4 0 0 4

Session: July 18 – Dec 18 | Faculty: Prof. G.L. Sharma, Mr. Ankur Srivastava, Mr. Alok Kumar Ansu | Class: B. Tech. Vth Sem.

Course Outcomes: At the end of the course, students will be able to

[ME1507.1] Understand basics of heat transfer: conduction, convection and radiation

[ME1507.2] Apply principles of heat transfer to engineering systems.

[ME1507.3] Design and analyze the performance of heat exchanging devices to improve the skills for employability.

[ME1507.4] Analyze the performance of phase change devices like evaporator and condenser.

[ME1507.5] Identify difference between heat and mass transfer on the basis of the driving potential governing them.

A. SYLLABUS

Introduction, Various modes of heat transfer. Conduction, Fourier law of heat conduction, Heat diffusion equation in Cartesian, Cylindrical and Spherical coordinate system, One dimensional steady state conduction applied to various cases e. g. plane wall, cylinder, sphere etc. Heat transfer from extended surfaces, Critical radius of insulation for cylinder & sphere, overall heat transfer coefficient, Convection, Review of Concept to Boundary Layer, empirical correlation for free & forced convection. Concept of Boiling and Evaporation, Boiling modes, Condensation: physical mechanism, Film and Dropwise condensation. Heat Exchanger, Heat Exchanger Analysis by LMTD and Effectiveness-NTU method. Radiation: - Radiation Intensity, Absorption, Reflection and Transmission by real surfaces, Kirchhoff's Law, Gray surface. Radiation exchange between surfaces, Gray surfaces in an enclosure. Mass transfer: Introduction, diffusion mass transfer, Fick's law of diffusion, steady state molecular diffusion.

B. TEXT BOOKS

- I. J.P.Holman, *Heat Transfer*, McGraw Hill, New York, 1997.

REFERENCE BOOKS

- I. P.F. Incopera, D.P. Dewitt, *Fundamentals of Heat and Mass Transfer*, John Wiley Publication(2014)
- II. Yunus , Cengel, *Heat Transfer- A Practical Approach*, Mc Graw Hill Publication, Latest Edition

