Selvam College of Technology
An Autonomous Institution
Accredited by NAAC with "A" Grade, UGC Recognized 2(f) Status,
An ISO 9001:2015 Certified Institution, Approved by AICTE New Delhi, Affiliated to Anna University-Chennai
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ME3691-HEAT AND MASS TRANSFER

REGULATION:2021
YEAR/SEM: III/VI

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SYLLABUS

COURSE OBJECTIVES

1.To learn the principal mechanism of heat transfer under steady state and transient conditions.
2.To learn the fundamental concept and principles in convective heat transfer.
3.To learn the theory of phase change heat transfer and design of heat exchangers.
4.To study the fundamental concept and principles in radiation heat transfer.
5.To develop the basic concept and diffusion, convective di mass transfer.

UNIT – I CONDUCTION **12**

General Differential equation – Cartesian, Cylindrical and Spherical Coordinates – One Dimensional Steady State Heat Conduction — plane and Composite Systems – Conduction with Internal Heat Generation –Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler's charts – Methods of enhanced thermal conduction

UNIT – II CONVECTION **12**

Conservation Equations, Boundary Layer Concept – Forced Convection: External Flow – Flow over Plates, Cylinders Spheres and Bank of tubes. Internal Flow – Entrance effects. Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres. Mixed Convection.

UNIT – III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS **12**

Nusselt's theory of condensation- Regimes of Pool boiling and Flow boiling - Correlations in boiling and condensation. Heat Exchanger Types – TEMA Standards - Overall Heat Transfer Coefficient – Fouling Factors. LMTD and NTU methods. Fundamentals of Heat Pipes and its applications.

UNIT – IV RADIATION **12**

Introduction to Thermal Radiation - Radiation laws and Radiative properties - Black Body and Gray body Radiation - Radiosity - View Factor Relations. Electrical Analogy. Radiation Shields.

UNIT – V MASS TRANSFER **12**

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state and Transient Diffusion -Stefan flow –Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

TOTAL: 60 PERIODS

OUTCOMES: At the end of the course the students would be able to

1. Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems.
2. Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems.
3. Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems.
4. Explain basic laws for Radiation and apply these principles to radiative heat transfer between Different types of surfaces to solve problems.
5. Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications.

TEXT BOOKS:

1. R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2009
2. Yunus A. Cengel, "Heat Transfer A Practical Approach" – Tata McGraw Hill, 5$_{th}$Edition – 2013

REFERENCES:

1. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley &Sons, 7th Edition, 2014.
2. Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 2010
3. Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 2012
4. Ozisik, M.N., "Heat Transfer", McGraw Hill Book Co., 1994.
5. S.P. Venkateshan, "Heat Transfer", Ane Books, New Delhi, 2014