Sem 6 ME

Syllabus

Course Name: Heat and Mass Transfer [3:0:2=4]

Course Content:

Steady State Heat Conduction

Introduction to heat transfer, Conduction, Convection and Radiation Mechanism, Thermal conductivity, Thermal diffusivity, Steady state heat transfer, General equation for conduction heat transfer, Boundary Conditions, Temperature distribution for plane wall, cylinder and sphere, Thermal resistance concept, Steady state heat transfer problems, Fins, heat transfer and temperature distribution differential equation, effectiveness, efficiency

Transient Heat Conduction

Steady vs Transient heat conduction, Lump System Analysis, Transient heat conduction, Analysis using Heisler Charts

Convection Heat Transfer

Force convection, Laminar & Turbulent flow, Viscosity, Velocity and Thermal Boundary layer over flat plate, , Reynolds number, Nusselt number, Prandtl number, Empirical correlations for solving Flat Plate Heat Transfer, Velocity and Thermal boundary layer inside a pipe, Empirical correlations, Natural convection mechanism, Grashoff's number.

Radiation Heat Transfer

Introduction to Electromagnetic waves, Thermal Radiation, Black body radiation, Solid angle, Intensity, , Emissivity, Absorptivity, Reflectivity, Stefan's Law, Plank's Law, Spectral Emissive Power, Kirchoff's law, Radiation exchange between grey bodies.

Heat Exchangers & Mass Transfer

Heat exchangers, Parallel & Counter flow Heat Exchangers, Overall Heat Transfer Coefficient, LMTD Method, Effectiveness-NTU method, Introduction to Boiling Regimes, Pool Boiling, Condensation. Introduction to Mass transfer, Analogy between Heat & Mass Transfer, Mass Diffusion, Fick's Law of diffusion

Course Outcomes:

CO1: To understand the laws governing the rate of heat transfer.

CO2: To apply the conduction, convection and radiation principles for heat transfer rate calculations.

CO3: To apply the empirical correlations for convection heat transfer rate calculations.

CO4: To analyze the heat transfer phenomena across various thermal systems.

Textbook:

1. Yunus A. Cengel, Heat and Mass Transfer, 5th Edition, Tata McGraw-Hill, India, 2015.
2. Dewitt Lavine, Bergmann and Incropera, Fundamentals of Heat and Mass Transfer, 6th Edition, John Wiley & Sons, India, 2010.

Reference books:

1. DK Dixit, Heat and Mass Transfer, Tata McGraw Hill Publishing Company Limited, India, 2016.
2. P. K. Nag, Heat and Mass Transfer, Tata McGraw Hill Publishing Company Limited. India, 2011.

Course Name: Machine Design **[4:0:0=4]**

Course Content:

MODULE-1: Design factor and factor of safety

MODULE-2: Theories of failure

MODULE- 3: Fatigue

MODULE- 4: Design of shafts

MODULE- 5: Design of springs

MODULE-6: Fasteners types and uses, Thread forms, Design of bolted joints for static & dynamic loading, Eccentric loading of bolted joints and Working principle & Design of Power screws

MODULE-7: **Welded joints**: Types of weldments and symbols, Strength of welded joints, Eccentric loading of welded joints

MODULE-8: **Gears**- Different types of gears and gear teeth nomenclature, conjugate action, contact ratio, interference and pressure angle in gears, forces under various loading conditions in spur, helical and bevel gears, design of spur gear drive

MODULE-19: **Brake**: Introduction to Brakes, Drum Brakes, Pivoted Shoe Brakes, Energy Consideration in Brakes

MODULE-10: Design issues in using different flexible elements like belt and chain drive

MODULE-11: **Clutch**: Plated Clutches, Energy Consideration in Clutches

MODULE-12: Theories of lubrication: full and partial journal bearings and design of same by using design charts and design & selection of rolling element bearings

PROJECTS:

(1) Design of gear box including bearings and clutches for motorcycle
(2) Design of brakes for efficycle vehicle
(3) Design of welding joints for efficycle chassis**.**

Course Outcomes:

CO1: Understand the concepts of failure and fatigue.

CO2: Calculate the design parameters of various machine elements.

CO3: Create designs for a system involving various machine elements.

Textbook:

1. Budynas, Richard and Nishbett, J. KeithShigley's Mechanical Engineering Design, McGraw Hill