

## VI Semester

### HEAT TRANSFER M 351

#### UNIT - I

Steady State Conduction: Fourier's law and general conduction equation in Cartesian & cylindrical coordinates, Analysis of composite slabs and cylinders, insulation desirable properties and critical thickness of factors affecting conductivity of metals, liquids, gases and insulators, Effect of variable conductivity.

Unsteady state Heat Transfer : Newtonian heating/cooling, sudden temperature, periodic heat flow, solution of unsteady state problems using Heisler charts.

#### UNIT- II

Radiation: Mechanism, electromagnetic spectrum, reflectivity, absorbtivity, transmissivity, emissivity, emissive power, intensity of radiation, Planck's law, Wien's law, Stefan Boltzman's law and Kirchoff's law. View factor for simple geometries and view factor relations, Concept of black and gray body, Black body radiation exchange, radiation shields.

#### UNIT – III

Convection: Analysis of free and forced convection using dimensional, analysis, significance of various dimensionless numbers e.g. Reynolds number, Prandtl number, Nusselt number, Grashoff's number, Biot number, empirical co-relations for plates and pipes under natural/forced convection conditions. Concept of thermal and hydrodynamic boundary layer.

Heat Transfer & temp. distribution in rectangular fins (Longitudinal & annular) of uniform cross section, effectiveness and efficiency of fin.

#### UNIT – IV

Heat Exchangers: Definition and classification, concept of LMTD and overall heat transfer coefficient, fouling factor, NTU method to analysis exchangers performance. Derivation LMTD and effectiveness for parallel and counter flow heat exchangers.

#### UNIT – V

Condensation and Boiling: Heat transfer condensation process: Mechanism of condensation, Nusselt's theory, dropwise & filmwise condensation, boiling heat transfer, nature of vaporization, nucleate pool boiling, empirical co-relation for boiling heat transfer, Boiling curve.

#### Books and References:

- |    |                        |               |
|----|------------------------|---------------|
| 1. | Heat and Mass Transfer | D.S. Kumar    |
| 2. | Heat and Mass Transfer | S. Domkundwar |
| 3. | Heat Transfer          | S.M. Yayha    |
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## **MACHINE DESIGN II**

### **M 352**

#### **UNIT- I**

Fatigue - Importance in Engineering design, concept of fatigue, fatigue strength and endurance limit, stress concentration, Goodman and modified Goodman diagram, Soderberg and Gerber hypotheses, effect of loading type, size, surface finish, notch, surface treatment, and corrosion, cumulative fatigue damage, applied problems.

#### **UNIT -II**

Gears - design consideration, Hertzian stresses, design load, beam strength, surface strength, design procedure for helical and spur gears, design calculation for bevel and worm gears.

#### **UNIT - III**

Creep- temperature considerations in design, creep, designing for creep, thermal stresses, applied problems.

Bearing- Classification, design of hydrodynamic bearings, selection of ball and roller bearings.

#### **UNIT - IV**

Design of the following:

1. Rotating Machines e.g. Centrifugal Pump, Compressor.
2. Gear Box

Introduction to various CAD softwares.

Not: Unit I, II, & III shall carry a weightage of 20% each. Unit IV shall have 40% weightage in theory paper.

#### **Books and References:**

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|-----------------------------------|--|
| 1. Mechanical Analysis and Design | Burr and Chetan                            |
| 2. Centrifugal Pumps and Blowers  | Church & Jagdish Lal                       |
| 3. Mechanical Engineering Design  | J.E. Shigley and Charles<br>R.Mischke, TMH |
| 4. Machine Tool Design            | N.K. Mehta                                 |
| 5. Design of Machine Elements     | V.B. Bhandari, TMH                         |

**MECHANICAL BEHAVIOUR & CHARACTERISATION OF  
MATERIALS  
M 353**

**UNIT - I**

1. Mechanical behaviour of Metals, Stress strain curve, yield criteria and constitutive relationship, theory of dislocations, yield point phenomenon and strain ageing, strengthening mechanisms.

**UNIT - II**

2. Types of failure, ductile and brittle failure, Griffiths theory and its modification, creep, fatigue failures factors affecting, prevention and correlation of properties with microstructure.

**UNIT - III**

3. Structure and Mechanical behaviour of polymers, deformation mechanisms, time dependent deformation, deformation models.

**UNIT - IV**

4. Testing of material, creep and fatigue testing , testing of polymers, NDT.

**Books and References:**

1. Mechanical behaviour of materials- Dietor
  2. Testing of materials . ABK Suryanarayan
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**AUTOMOBILE ENGINEERING**  
**M 354**

**UNIT I :**

Fuels and fuel systems: general introduction.

SI Engines fuel injection systems: Requirement and need for fuel injection. Classification of systems in practice. MPFI system operation construction and working of important sensors used in FI injection system. CI Engine fuel injection systems : Requirement of Diesel injection systems. Classification – injectors for CI Engines.

**UNIT II :**

Engine induction and Exhaust Systems: Requirements and considerations. Manifold flow paths and tuning. Introduction to exhaust gas extraction. Turbocharging, types, variable geometry turbocharger.

Engine valve operating systems: Effect of Valve timing and valve lift on engine operation; variable valve lift and variable valve timing. Valve operating conditions. Multi valva engines.

**UNIT III :**

General: Development & Advances in Automobile Engineering, Engine types

Advanced Engine systems: Ignition systems for petrol engines. Advanced cooling concepts, radiators and thermostat. Wind shield wiper fuel gauge.

Chassis and suspension: Requirements and general consideration of strength and stiffness. Engine mountings, types of suspension.

**UNIT IV :**

Transmission: Clutch, types, fluid flywheel, torque converter, gear boxes, universal joint, propeller shaft, differential, rear axles and their types, front axles and their types.

Steering: Factor controlling rolling and directional stability, castor angle, wheel camber, steering geometry and system, power assisted steering.

**UNIT V :**

Brakes: Principle of braking system, braking mechanism, mechanical and hydraulic brakes, power brakes, vacuum and air brakes.

Wheels and Tyres: Wheel drum, tyre, materials and manufacturing of tyres, trouble shooting and maintenance.

**Books and References:**

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|----|----------------------|------------------------|
| 1. | Automotive Mechanics | Heitner                |
| 2. | Automobile Engg.     | GBS Narang             |
| 3. | Automobile Engg.     | TR Banga & Nathu Singh |
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# OPERATION RESEARCH

M 355

## UNIT-I

Introduction: Definition and scope of operations research, problem formulation and model construction.

Linear Programming: Concept of optimality, graphical solution, simplex method, duality, sensitivity analysis, degeneracy.

## UNIT-II

Transportation and assignment model: Transportation and assignment problems as special cases of linear programming, balanced and unbalanced transportation problem, assignment problem, trans shipment problem.

## UNIT-III

Inventory System: Definition, structure of inventory system, deterministic models and their relation, multi item inventory problem, introduction to stochastic inventory control.

Sequencing : Johnson's rule, Graphical and analytical method.

Markov's chain analysis.

## UNIT-IV

Replacement analysis: Replacement of capital equipment, discounting cost, replacement in anticipation of failure, group replacement.

Game theory: Pay off matrix, competitive games with pure strategy, minimax criteria, principles of dominance and mixed strategies.

## UNIT-V

Network analysis: Project planning, difference between PERT and CPM, crashing of network , resource leveling, probability calculations in PERT analysis.

Queuing theory: Introduction to probability theory, queuing problem, case of poisson arrivals and exponential service time for single channel system.

## Books and References:

1. Quantitative Techniques in Management by N. D. Vohra
  2. Operation Research by P.K. Gupta & D.S. Hira
  3. Operation Research by Sesiani, Arkoff & Arkoff
  4. Principles of Operation Research by Wagner
  5. Operation Research by A.P.Verma
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**THERMAL ENGG. – III & HEAT TRANSFER LAB.  
M 393**

THERMAL ENGG. – III

1)	Steam Power Plant Trial
2)	Performance Test on Steam Condenser
3)	Performance Test on Nozzle Test Rig
4)	Test on 2 Stage Compressor

HEAT TRANSFER LAB

<b>S. No.</b>	<b>Name of Experiment</b>
1.	Determination of overall heat transfer coefficient for parallel and counter flow heat exchangers
2.	Determination of effectiveness of given double pipe heat-exchanger
3.	Determination of overall heat transfer coefficient for cross flow air/water heat exchanger
4.	Performance of heat pipe as compared with thermal siphon and air pipe
5.	Thermal conductivity of a material by guarded ring type apparatus
6.	Determination of heat transfer in forced convection
7.	Determination of Stefan Boltzman constant by Stefan Boltzman apparatus

**Manufacturing Technique Lab II : Please ADD sYLLABUSM 394**

**General Proficiency**

**M399**

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**Minor Project/ Seminar**

**M 395**