ME 6001 AUTOMOBILE ENGINEERING

Module 1:

Carburetion, Injection systems and Electrical systems; Simple carburetor, modification of simple carburetor for conditions of Economy Power Accelerations. Idling and starting M.P.F.I. and F.I. system. Injection system of C.I. Engines, Bosch pump injection.

Battery and cranking motor, the charging circuit, the ignition system and other electrical devices.

(5 Lectures)

Module 2: Mechanics of Motor Vehicle: Power for propulsion, rolling, air and grade resistance, Traction and tractive effort, road performance curves, Acceleration, gradeability and Draw par pull calculation of maximum acceleration, maximum acceleration, maximum tractive effort and reactions for different drivers.

(5 Lectures)

Module 3: Power Transmission Systems: General arrangement of clutch, friction clutch, gear box, torque transmission, fluid flywheel, sliding, constant and synchromesh type gear box, epi-cyclic gear box, live axle transmission, Rear engine vehicles. Type of axles, Axle less transmissions, Four wheel drive.

(5 Lectures)

Module 4: Torque converters and Automatic transmission: Torque convertor, Turbo transmitter convertor, Automatic transmission, Borg-Warner transmission, Automatic control and central mechanism. (5 Lectures)

Module 5: Drive Lines and Rear Axles: Universal joints, propeller shaft, Live rear axle, find drive, torque reaction, thrust systems, differentials, wheel bearing.

(5 Lectures)

Module 6: Front Axle, Steering Mechanism and Carriage Unit: Primary construction, ackarman linkage, center point steering, Axle construction, steering mechanisms, wheel alignments, independent and dead axle suspension.

Frame design, types and actions of springs and dampers, chasis lubrication.

(5 Lectures)

Module 7: Brakes and Tyres: Functions and method of operation, types, linkages, hydraulic mechanism servo and power brakes, Types of tyre and tubes. (5Lectures)

Books:

1. The Motor Vehicles by Newton and Steeds
2. Automotive Mechanic: by W.H. Crouse
3. Automotive Mechanics by Heitner

ME 6003 HEAT AND MASS TRANSFER

Module-1 Introductory concepts, modes of heat transfer – conduction, convection and radiation, basic equations and applications, generalized conduction differential equation, simple steady and unsteady state solution, one dimensional heat conduction without heat generation and with heat generation composite walls, cylinders and spheres, electrical analogs of thermal systems.

(6 Lectures)

Module-2 Extended surfaces (Fins) : General equation, temperture distribution, heat flow, fin efficiency, effectiveness, variable area, circumferential fin, pin fin of variable section.

(4 Lectures)

Module-3 Radiation: Definition and laws of thermal radiation, black body, real surfaces, gray surfaces, radiation properties, shape factor, radiosity, irradiation, electrical analogy, three-surface system, radiation shield. (5 Lectures)

Module-4 Convection: Concept of viscous and thermal boundary layers, laminar and turbulent flow, continuity equation, momentum equation, energy equation, solution for laminar flow, integral equation, Nusselt number correlations-constant heat flux, turbulent flow, flow across cylinders, force convection for internal flow-laminar & turbulent.

(7 Lectures)

Module-5 Natural convection: Grashoff number, analytical method, integral method, practical correlation, constant heat flux, horizontal and inclined flat surfaces, cylindrical surfaces, combined free and forced convection.

(4 Lectures)

Module 6: Heat Exchanger: Types of heat exchanger, LMTD method of analysis, correction factor concepts, NTU – effectiveness method of analysis, storage type exchangers, basic ideas of boiling process and mechanism. (5 Lectures)

Module-7 Mass Transfer: Molecular diffusion, equimolal counter diffusion, diffusion into a stationary medium, convective mass transfer, Numberical problems. (4 Lectures)

Books:

1. Heat and Mass Transfer by J.P. Holman
2. Heat Transfer by S. P. Sukhatme
3. Heat and Mass Transfer by P. K. Nag
4. Heat and Mass Transfer by D.S.Kumar
5. A course in Heat Transfer by Arora and Domkundwar

ME 6005 DYNAMICS OF MACHINES

Module 1: Balancing of revolving masses and locomotives: Balancing of several masses revolving in the same plane and different planes. Primary and secondary unbalance in reciprocating engine mechanism, partial balancing of a reciprocating mass by a revolving mass; partial balancing of two cylinders un coupled locomotive engine, Hammer blow; variation of tractive effort, swaying. Couples, coupled wheels of a locomotive.
(7 Lectures)

Module 2: Balancing of Engines: Balancing of in line, radial and V-type multicylinder engines, Direct and Reverse cranks. Engine firing timings, principles of balancing machines
(6 Lectures).

Module 3: Governors: Centrifugal governors – Porter, Proel, Hartnell; Sensitiveness hunting, Isochronism stability Effort and Power, Effect of friction on sensitiveness.
(6 Lectures)

Module 4: Gyroscope: Gyroscopic couple, Gyroscopic effect on naval ship, stability of two wheeled and Four wheeled vehicles. (6 Lectures)

Module 5: Frictional Devices: Power Screws, pivot and collar bearings, plate and cone clutches, Band and Block Brakes, shoe brakes, friction axis (7 Lectures)

Module 6: Vibration, types of vibrations and its effect on the elastic constraints, undamped free longitudinal, transverse and torsional vibrations, torsional vibration of a geared system.
(7 Lectures)

Module 7: Damped free vibration, logarithmic decrement, forced vibrations, vibration isolation, transmissibility (6 Lectures)

Books:

1. Theory of Machine by P.L. Balaney, Khanna
2. Theory of Machines by Thomas Beven.
3. Theory of Machines by S.S. Rattan.

ME 6007 DESIGN OF MECHANICAL SYSTEMS

Module 1: Design of Spur and Helical gears, Reduction gear boxes. (5 Lectures)

Module 2: Design of Bevel and Worm gears, Differential gear boxes. (5 Lectures)

Module 3: Rolling contact and sliding contact bearings. (5 Lectures)

Module 4: Design of I.C. Engine parts: cylinder, Piston, connecting rod, crank shaft and valve. (5 Lectures)

Module 5: Design of centrifugal pump. (5 Lectures)

Module 6: Pressure vessels, supports, openings (5 Lectures)

Module 7: Optimization and Probabilistic approach in Machine Design. (5 Lectures)

Reference Books:

1. Machine Design, Maleev and Hartman, CBS Publisher & Distributor, New Delhi, 1983.
2. Mechanical Engineering Design, J.F. Shighly, McGraw Hill Book Company, U.S.A. 1986.
3. Machine Design, Sharma and Agarwal, S.K. Kataria and Sons, New Delhi, 2001.
4. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill, New Delhi, 1999.
5. Mechanical Reliability, L.S. Shrinath, Affiliated East West Press, New Delhi, 2002.
6. Hand Book of Properties of Engineering materials and Design Data for Machine Elements, Abdulla Shariff, DhanptatRai& Co., New Delhi 2001.
7. Machine Design by U. C. Jindal, Pearson Education, N. Delhi,2010