AUTOMOBILE ENGINEERING

Course Code: 13ME1142

Pre requisites: Thermal Engineering

Course Educational Objectives:
The student will be made to learn

✦ The anatomy of the automobile in general
✦ The location and importance of each part
✦ The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels
✦ Suspension, frame, springs and other connections
✦ Emissions, ignition, controls, electrical systems and ventilation

Course Outcomes:
The student will be able to

✦ Identify the different parts of the automobile
✦ Explain the working of various parts like engine, transmission, clutch, brakes
✦ Describe how the steering and the suspension systems operate.
✦ Understand the environmental implications of automobile emissions
✦ Develop a strong base for understanding future developments in the automobile industry

This is a first course in automobile engineering introducing the anatomy and the functioning of all major components of the modern automobile. With an introduction to the engine and its accessories, the course deals in detail with the description of automobile components like clutch, transmission, final drive, axles, wheels, suspension, steering, electrical systems among others. Concepts of modern automobile controls are also included.
UNIT-I  
(12 Lectures)
General introduction, types of automobiles, classification of automobiles, chassis and body, frames, frameless construction, sub-frames, defects in frames. Different systems in an automobile, brief introduction to important parts. Automobile engines, different parts and auxiliary systems, engine terminology, four-stroke and two-stroke operation, multi-cylinder engines, engine balance, power overlap. Engine accessories, engine lubrication, points of lubrication, types of lubrication systems, wet sump and dry sump, lubrication schedule, properties of lubricants, oil pumps, oil filters, crankcase dilution and crankcase ventilation.

UNIT-II  
(12 Lectures)
Fuel induction in SI and CI engines, fuel pumps and air cleaners, problems in carburetors, direct injection of gasoline, MPFI and TBI, advantages and disadvantages, concepts of electronic injection, diesel injection systems, concepts of supercharging and turbo-charging, waste-gating principle. Principle of ignition, ignition coil, condenser and distributor, ignition systems without storage battery, electronic ignition, ignition timing and ignition advance, spark plugs. Combustion in SI engines and CI engines, swirl and turbulence, types of combustion chambers in automobile engines. Engine cooling, heat balance, effects of improper cooling, air cooling, radiator details and functioning, thermostats, anti-freeze additives, heater core

UNIT-III  
(12 Lectures)
Manual transmission and types of gear box, sliding-mesh, constant-mesh and synchromesh gear boxes, types of dog clutches, gear shift mechanism, principles of automatic transmission. Clutch operation and types, multi-plate and cone clutches, clutch construction and lining. Propeller shafts, universal joints, slip joint, Hotch-Kiss drive and torque tube drive, transaxle and transfer case, radius rods, four wheel drive arrangement. Automobile emissions, their harmful effects, pollution control measures, catalytic converters, exhaust system layout, mufflers, resonators.

Engine parameters, brief discussion of testing devices, engine service, engine tuning, engine re-boring, cyaniding, nitriding, de-carbonisation.

UNIT-IV  
(12 Lectures)
Braking systems, layouts for mechanical braking, hydraulic braking,
pneumatic braking, master cylinder, wheel cylinder, tandem cylinder, shoe brakes, disc brakes, requirements of brake fluid, power brakes, concept of ABS and traction control, parking brakes. Steering system, principles and need of steering, components parts, steering gear, steering ratio, steering lock, turning radius, centre point. Steering, wheel geometry, power steering principle and typical schemes,

Front axle scheme and end connections, rear axle, functions, types of rear axle, loads on rear axles, axle casing.

UNIT-V (12 Lectures)

Suspension system, functions of suspension, component parts, coil springs, leaf springs, air springs, shock absorbers, torsion bars, stabilizer bars, typical combinations of components in suspension systems, MacPherson strut suspension, its merits.

Wheel and tyres, wheel assembly and parts, pressed wheels and cast wheels, wheel rim, tyres, aspect ratio, tyres with tubes and tubeless tyres, advantages, construction of a tyre, plies, radial plies, tyre treads and tyre specifications.

Electrical systems, generator circuit and need for cut-out, starting with solenoid and over-running clutch, lighting points in a passenger car, high beam and restricted high beam from head lights, circuits for flashers, horn, wind screen wiper, fuel level indicator, speedometer

Cabin heating and cooling, simple schemes.

TEXT BOOKS:

REFERENCES: