

# **AUTOMOBILE ENGINEERING**

**(DEGREE STANDARD)**

**CODE: 258**

## **UNIT I ENGINES**

Petrol engine – principle and construction – diesel engine- principle and construction – four stroke and two stroke. Carburetors – types, working principle, different circuits – compensation circuits. Cooling system – air and water cooling system- forced circulation and pressure cooling system. Lubrication system – pressure lubrication – splash lubrication – wet and dry sump lubrication. Properties of lubricants and coolants. Combustion in SI and CI engines – stages of combustion –flame propagation – detonation in SI engine and knocking in CI engines. Combustion chambers – Turbo and super chargers.

## **UNIT II AUTOMOTIVE CHASSIS**

Types of chassis layout – various types of frames – front axles – types, stub axle, front wheel geometry – Ackermann & Davis steering mechanism – steering gear boxes. Power Assisted steering. Hotch kiss and torque tube drive. Propeller shaft – final drive – types. Differential –principle and construction details- non slip differential – differential lock. Rear axle - types – full floating –  $\frac{3}{4}$  quarter & semi. Wheels and rims – types and construction. Tyres – types and construction details.

## **UNIT III SUSPENSION AND BRAKING SYSTEM**

Suspension system – requirements – types - construction details of Single leaf and multi leaf coil and torsion bar springs. Rubber, pneumatic and hyroelastic suspension. Independent suspension – shock absorbers. Braking system – need, stopping distance, classification of brakes. Drum brake and disc brake theory. Mechanical, hydraulic, pneumatic, electric and power assisted braking system. Retarders.

## **UNIT IV AUTOMOTIVE TRANSMISSION**

Clutches – coils spring, diaphragm clutches – centrifugal and semi centrifugal clutches – multiplate clutches. Gear box – sliding mesh, constant mesh and synchromesh – construction and operation. Automatic transmission – fluid coupling, torque converter, epicyclic gear box, hydrostatic transmission, electric drive

## **UNIT V AUTOMOTIVE ELECTRICAL AND ELECTRONICS**

Battery – types, lead acid battery, battery charging, rating, and testing. Ignition system – coil, magneto and electronic ignition system – principle and operation. Spark plug – Automobile Air conditioning, power windows and central locking system – starting system – types of drives - bendix drive, solenoid drive system – charging system – generator system – types – alternator, principle and operation of cut-out and regulators. Sensors – electronic suspension – electronic steering systems. Navigation system – ABS – AIRBAG restraint system.

## **UNIT VI VEHICLE BODY ENGINEERING**

Classification of cars, buses, HCVs and LCVs – visibility – forward and rearward visibility – safety – design – safety equipments. Aerodynamics of vehicles – different types of drags – optimization techniques - wind tunnel testing for drag force and pressure distribution. Construction of cars – panels . Construction of buses – conventional and integral construction. Driver's seat – compactness of driver's cab – segmental design – modern painting processes for cars. Body trim items. Body mechanism – window winding – door lock.

## **UNIT VII VEHICLE DYNAMICS**

Concept of vibration – free, forced, undamped and damped vibration. Response analysis of single DOF, Two DOF and multi DOF. Vibration absorbers. Tyres – tyre forces and moments – longitudinal and lateral force at various slip angles. Tractive and cornering properties of tyres. Human response to vibration. Design and analysis of passive, semi active and active suspension using quarter car, half car and full car models. Steady state handling characteristics – directional control of vehicle. Stability of vehicle.

## **UNIT VIII VEHICLE CONTROL SYSTEMS**

Degree of freedom for vehicle control – calculation of the control - degree of freedom. Selection of control, manipulator and measured disturbances variables. General types

of vehicle controllers configuration. Dynamic behavior of first order and second order vehicle system – dynamic responses characteristics of vehicle systems. Basic control modes – proportional control – integral control. PID controls. Lambda control – knock control – adaptive knock control – drive line modeling – active suspension control.

### **UNIT IX AUTOMOTIVE POLLUTION AND CONTROL**

Pollutants – sources, formation and effects on environment and human beings. Emission standards. HC,CO and NO formation in SI engines. Smoke emission and NO<sub>x</sub> emissions and its types from diesel engine. Particulate emissions. Control techniques – EGR, SCR, Secondary air induction, particulate trap and catalytic converters. Test procedures CVS1, CVS3 – Test cycles. NDIR analyser – flame ionization detectors – chemiluminescent analyser – dilution tunnels – gas chromatograph – smoke meters.

### **UNIT X SERVICING&MAINTENANCE, MOTOR VEHICLE ACT**

Automobile law – motor vehicle act – registration, driving licence, insurance, pollution and control, regulation. Trouble shooting and servicing of clutch, gear box, brakes, suspension and steering system. Trouble shooting and servicing of engine, engine cooling system and lubrication system – tools and equipments required for repairs – service station – organization and management of service stations.