SYLLABUS: Motor Vehicle Inspector in Transport Department

1) Basics:- Belt, chain and gear drives, speed ratio, friction clutches, rolling Friction. Vibration-causes & remedies, shock absorber. Torsion in solid & Hollow shafts. Springs (Helical & leaf springs). Hydraulics and hydraulics machineries, Fluid and its properties, Laminar and turbulent flow, Bernoulli's Theorem, Fluid Pressure, Pascal's Law, Surface tension, fluid flow and its measurement. Hydraulic pumps., Fluid pumps - Types and working. Basic principles of Thermodynamics concepts. Gas laws, Laws of Thermodynamics and processes. Gas power cycle, Carnot cycle, Otto cycle and Diesel cycle. Air compressors (Single & Multi stage). Supercharger. Types description & working, Air conditioning and related cycles.

2. Thermal Engineering: Thermodynamic Laws, Principle and working of heat Engine, air compressors, Air Standard vapours power and gas power cycles. Classification, two stroke and four stroke cycles, their relative merits and demerits. Constructional details, working and special features of petrol and diesel Engines and their components. I.C. engine system, components and their working. Air-fuel supply system and fuel used(Petrol & Diesel), Inlet & Exhaust Systems. Cooling systems and coolants. Lubrication systems, lubricant and their properties. Ignition systems and system equipment's. MPFI and CRDI system. SI and CI Engine combustion chambers. Fundamental of air conditioning, Servicing of vehicle air conditioning and Heating systems.

3. I.C. Engine Testing and Performance: Performance parameters, finding of I.H.P., BHP, FHP by Morse test, methods of finding BHP by dynamometers. Mechanical, Thermal, Volumetric, Air standard and Relative efficiencies of I.C. engine. Heat balance sheet. Combustion phenomenon in SI and CI engines, pre ignition. Knocking or Detonation phenomenon. Octane & cetane ratings, measurement of Exhaust smoke, Exhaust Emissions and Emission standards of Bharat stage I, II, III, IV.

4. Transmission system: Construction and Working of single plate, multi plate, cone cluch, centrifugal clutch. Faults and remedies/repairs of clutches. Gear Box-construction and working of sliding mesh, constant mesh, synchromesh, torque converter, Faults and remedies/repairs of Gear Box

5. Automobile Vehicle:- Classification, components and their function, layout of chassis and its alignment, alternative arrangements used in respect of Engine position, front wheel, rear wheel & four wheel drives, Final drives (Differentials), Power transmission system, auto electrical equipment and system. Brakes, Braking system and

its components, Anti Braking System, drum brakes, disc brake, Hand Brake, Brake trouble shooting, ABS. Frames and suspension system.

6. Steering System: Front axle, types of stub axle, steering geometry, Ackerman's Principle of Steering, Under steer, over steer, steering linkage. Types of steering gears, power steering, wheel alignment, wheel balancing. types of wheels, types of tyres, tyre specification, importance of maintaining tyre pressure, tyre troubles and repair. Tyre re-treading (cold and hot), tubeless tyre.

7. Automobile Servicing and Maintenance, Automobile Electrical Systems: Garage & Service station tools and equipment-Servicing & maintenance procedures- Servicing and Maintenance of 2 & 4 wheelers- Automobile Reconditioning Equipment-Reconditioning of Diesel FIP & injectors-Vehicle Testing & Diagnosis-Automotive Emission and Control-Fundamentals of Electrical Technology-Basic Electronic Devices-Batteries-Ignition System- Generating System-Starting Motor-Wiring System. Lighting and Accessories.

8. Starting drives: Starter motor drive-Bendix drive, over running clutch drive, Folo through self-starter drive, working of dynamo and alternator, specifications of alternator cut out, relay and regulator.

9. Miscellaneous: Inspection and Road testing of vehicles, Road worthiness requirements of auto vehicles, vehicle kinematic and dynamics, propulsion of vehicle, relation between engine revolutions and vehicle speed, Hotchkiss drive and Torque tube, Macpherson independent suspension system, important provisions of Motor Vehicle Act and Rules

10. Introduction to Electric Vehicle:

•Basics of **electric** vehicle technology

•Types of electric vehicle, **Battery** Electric Vehicle (BEV), Hybrid Electric vehicle (HEV) PHEV, Fuel cell Electric Vehicle (FCEV) etc

•Hybrid Electric vehicle (HEV) -**Basic** architecture of hybrid drive trains, Classification of HEV: Conventional HEV (Micro, Mild and Full hybrid series hybrid, parallel hybrid, series parallel hybrid, complex hybrid),

•Comparison, benefits and Challenges of **ELECTRIC** VEHICLES over conventional ICE Vehicles

•RETROFITTING of **ELECTRIC** VEHICLES

10.2. Electric Vehicle Components

•Electric motors (Basic types), Controllers, batteries, battery management systems (BMS) and Converters (Types)

•Chargers & Charging infrastructure - AC charging, DC Charging, Charging protocols, Connectors, Types of Charging station, Battery swapping stations, Regenerative braking systems

10.3. Energy Storage

Battery parameters, Physical Dimensions, Voltage and current rating, Capacity and pow, 'C' Rate, Battery Efficiency, Energy Density, Power Density, State of charge (SOC), Depth of discharge (DOD), State of Health (SOH), Operating Temperatures

10.4. Maintenance and Servicing of Electric Vehicles

•Vehicle Maintenance, introduction to EV safety Equipment's and tools. Introduction & Need of maintenance, Types of maintenance systems.

•Maintenance Schedule: Standard inspection points, schedule and requirements for Battery pack, Brakes, Chargers, connectors and cables used in EV

10.5 Safety and Regulations

•Definition of Safety, Hazard, accident, responsibility, authority, accountability, Monitoring, Need of Safety, Rules & Statutory regulations for safety of persons.

•Dos & don'ts for Electric Vehicle, Precautions to be taken to avoid fire due to electrical faults, types and operation of fire extinguishers, Safety related to EV and high voltage handling

10.6 Environmental and Economic Aspects

Importance of EV's for future and its environmental impacts

Economic considerations (cost of ownership, savings on fuel, benefits over ICE vehicle etc.)

History and Evolutions of EV's

11. Auto Electrical System: Automobile Battery, Charging system, Current & voltage regulation of alternator, Transducers, Sensors, Actuators and their application in automobile.

12. Automobile Pollution Control Engineering: Exhaust gasses emission control systems, CNG conversion, Automobile noise and its control. National and International norms for exhaust gas pollution control, PUC certification.

13. Vehicle Body Engineering and Dynamics: Miscellaneous body service, Minor and major body repairs, vehicle balancing, vibrations and performance.

14. Applied Mechanics: Statics and Dynamics, tensile force, law conservation of energy, static friction, centroid and centre of gravity, law of simple machine. Kinetic and potential energy, polygon law of forces. Varignon's Principle of Moments, Co-planer concurrent forces.

15. Hazard Management:Environment Protection, Green House Gas effect, Noise Pollution, PV Cell, working of solar cell, solar radiation, Liquid Fiat Plate Collector, Pyranometer, Earthquake, seismograph instrument, conventional and non-conventional source of energy. Disaster management.