

Preface

(Revised Edition)

With fast development of automobile industry, training in the field of automobile at basic level has become very important. Since a large technical manpower is required in this field, skilled workers for Automobile Industry is the need of the hour. Arrival of Maruti vehicles over 20 years ago, has changed the face of automobile in India. Since then, there is a fast pace development of automobiles in India which is increasing manifold day-by-day.

This book is written according to the syllabus formulated for Mechanic Motor Vehicle (MMV) and other automobile trades of I.T.I./I.T.C., 10 + 2 (vocational) and polytechnics as well as for trainees getting apprenticeship training in various industries. Large number of neat and clean diagrams with an easy-to-understand description of each topic in a step-by-step manner is the main feature of this book. **Four** new chapters on **Fuels and Emission Control, Gasoline Fuel Injection, Electronic Ignition System** and most importantly a chapter on **“CNG”** have been added. Some new diagrams have been added/improved for better understanding of topics. It is sincerely hoped that this work will prove to be of immense use to the trainees during the course of their craftsmen and apprenticeship training.

Suggestions and comments from Instructors and Training Officers are welcome for further improvement in next edition.

— Author

Contents

1. General Introduction to Automobiles and its History	1 – 6
Introduction to the Automobiles, History of Automobiles, Brief classification of Automobile Vehicles, Various kinds of Motor Body, Classification of Motor Vehicles, Exercise.	
2. Safety and Precautions	7 – 8
Safety of individual body, Safety of Work, Safety of Tools and Machines etc., Exercise.	
3. Hand Tools and Machines	9 – 24
Measuring Tools, Marking Tools, Cutting Tools, Dismantling and Assembling Tools, Machines of Automobile Workshop, Exercise.	
4. Brake Systems	25 – 41
Classification of Brakes, Hand Brake, Foot Brake, Mechanical Brake, Hydraulic Brake System, Simple Master Cylinder, Tandem Master Cylinder, Centre Valve, Master Cylinder, Wheel Cylinder, Possible Defects in Mechanical Brake System and their Rectifications, Air Brake, Defects in Servo Brake System and Air Brake Systems and their Rectifications, Exercise.	
5. Chassis Frame and Suspension System	42 – 51
Chassis, Types of Chassis Frame, Maintenance and Repair of Chassis Frame, Shock Absorber, Types of Shock Absorbers, Exercise.	
6. Front Axle and Steering System	52 – 64
Types of Front Axle, Steering System, Construction and Working of Steering System, Types of Steering, Steering Gear Ratio, Steering Linkage, Power Steering, Ackerman Angle, Wheel Alignment, Camber Angle, Castor Angle, King Pin Inclination, Toe-in and Toe-out, Checking and Precautions of Wheel Alignment, Exercise	
7. Internal Combustion Engine	65 – 77
Definition of Engine, Heat Engine—External Combustion Engine, Internal Combustion Engine, Working of Internal Combustion Engine, Working of Four Stroke Cycle Petrol Engine, Valve Timing Diagram, Two Stroke Cycle Engine, Working System of Two Stroke Engine, Compression Ignition Engine, Theoretical and Actual P.V. Diagrams, Difference between Four Stroke and Two Stroke Cycle Engine, Difference between Compression Ignition (Diesel) and Spark Ignition (Petrol) Engine, Exercise.	
8. Main Parts of Engine and their Repairs	78 – 106
Cylinder Block, Multi Cylinder Arrangements, Cylinder Wear, Methods of Cylinder Repair, Cylinder Liners, Cylinder Head, Oil Sump, Piston, Construction of Piston, Types of Piston Head, Piston Rings, Types of Piston Rings, Defects in Piston Rings, their reasons and remedies. Gudgeon Pin, Connecting Rod, Crank Shaft, Fixing Order and Engine Balancing with various cylinders. Power Overlap, Crank Shaft Servicing, Cam Shaft, Timing Gear, Fly Wheel, Engine Valve, Engine bearing, Inlet and Exhaust Manifold, Super Charger, Exhaust Pipe and Cylinder, Exercise.	
9. Introduction to Fuels and Emission Control	107 – 115
Fuels for I.C. Engines, Fuel Production, Important Qualities of Engine Fuels, Fuel for SI engines, Detonation, Pre-ignition, Fuel for CI engines, Introduction to Emission Control, Source of Emission, Types of Exhaust Emission, Controlling of Exhaust Emission, Thermal Reactors, Catalytic Convertors, ECS, EGR, Initiative Taken for Emission Reduction, Emission Norms.	

10. Fuel System of Petrol Engine	116 – 124
Fuel Tank, Fuel Filters, Fuel Supply Systems, A.C. Mechanical Fuel Pump, Faults and Remedies of A.C. Mechanical Fuel Pump, S.U. Electric Fuel Pump, Exercise.	
11. Carburettor and Air Cleaner	125 – 139
Carburettor, Working Principle of Simple Carburettor, Float Adjustment, Types of Carburettor, Classification of Carburettor, Carburettor Circuits, Typical Carburettors, General Defects in Carburettors and their Remedy. Air Cleaners, Exercise.	
12. Fuel System of Diesel Engine	140 – 154
Fuel System of Diesel Engine, Method of Fuel Injection, Phasing and Calibration, Injector — Types and Construction. Injector Tester, Types of Combustion Chamber, Diesel Engine Governor, Heater Plug, General Defects in Diesel Injection System, Reasons and Remedy, Exercise.	
12A. Gasoline Fuel Injection	155 – 163
Limitations of Carburettors, Advantages of Fuel Injection, Classification of Injection System, Single Point Injection, Multipoint Injection, Advantages of MPFI, Components of MPFI System, Sensors, Classification, Automotive applications of sensors, Fuel Delivery System, Fuel Pump, Pressure Regulator, Injectors, ECM, Sub Systems, Exercise.	
13. Cooling System	164 – 172
Necessity of Cooling System, Air Cooling System, Water Cooling System, Thermo Syphon Cooling System, Thermostat Valve, Radiator, Water Pump, Temperature Gauge, Useful suggestions regarding the Water Cooling System, Defects in Cooling Systems, their reasons and remedies, Exercise.	
14. Lubrication System	173 – 184
Main Purpose of Lubrication, Properties of Lubricants, Methods of Engine Lubrication, Forced Lubrication System, Splash Lubrication System, Low Pressure Lubrication System, Petro Systems, Dry Sump Arrangement, Oil Pressure Relief Valve, Oil Pressure Gauge, Oil Dip Stick, Oil Filter, Oil Filter Methods, Defects in Lubrication methods, their reasons and remedies. Lubrication instructions, Exercise.	
15. Clutch	185 – 195
Qualities of a good Clutch, Types of Clutch, Clutch adjustments. Clutch directions, Clutch maintenance. General defects in clutch and their remedies. Exercise.	
16. Gear Box	196 – 207
Necessity of Gear Box, Leverage Power, Gear Principle, Types of Gears, Types of Gear Box, Gear Shift Mechanism, Gear Box : Troubles and Remedies, Exercise.	
17. Universal Joint and Propeller Shaft	208 – 212
Universal Joint, Types of Universal Joint, Use of more than one Universal Joints, Slip Joint, Propeller Shaft, Hotchkiss Drive, Torque Type Drive. Exercise.	
18. Rear Axle and Differential	213 – 219
Rear Axle — Benjo Type, Split Type, Rear Axle Shaft Fitting, Differential, Construction of Differential and its working, Types of Tail Pinion and Crown Wheel Final Drive, Causes of Axle Brokening, Differential Backlash, Differential Adjustment, Noise in Rear Axle. Exercise.	
19. Wheels and Tyre Tubes	220 – 228
Types of Wheels, Maintenance of Wheel Rim, Tyres, Chief functions of Tyres, Construction of tyres. Size of tyres. Types of tyres. Tube, Safety measures while fitting or unfitting of tube on the tyre. Main causes of tyre wear. Tyre-tube repair. Tyre rotation. Safety of tyre. Inflation of tyre. Exercise.	

20. Auto Electricity	229 – 231
Conductors, Electricity, Electronic Principle of Electricity, Electric Current, Electric Volt, Resistance, Ohm's Law, Examples, Electrical circuits. Power, Watt, Kilowatt, Exercise.	
21. Battery	232– 239
Types of Battery, Parts and Construction of Battery, Charging a new battery, Identity of battery terminals, Battery charging methods, Use of extra battery, Chemical reaction in battery, Equation at the time of discharge. Battery testing, Troubles of battery, Battery Maintenance, Precautions for battery. Exercise.	
22. Ignition System of Petrol Engine	240 – 255
Magneto Ignition System, Single Cylinder Magneto Ignition Systems, Magneto Maintenance, Battery Ignition System, Ignition Coil, Distributor, Construction of Distributor, Maintenance, Distributor Cap, C.B. Point, C.B. Point Gap, Defects in C.B. points and their remedies. Gap setting with Feeder Gauge, C.B. Point gaps in Indian Motor Vehicles, Setting of Ignition Timing, Condenser, Condenser Testing, Effects of defective Condenser Rotor, Centrifugal Weights, Vacuum Advance Mechanism, Required ignition advance timing, Distributor Maintenance, Spark Plugs, Terminal, Types of Spark plugs, MICO Spark Plug Recommendation Chart, Maintenance of Spark Plugs, Possible Defects in ignition system and their remedies. Exercise.	
22A. Electronic Ignition System	256 – 261
Introduction, Types of Ignition Systems, Primary Circuit Control, Electronic Primary Circuit Advantage, Ignition Transistor Operation, Dwell in Electronic Ignition, Rotor Air Gap, Spark Advance in Electronic Ignition, Exercise.	
23. Automobile Dynamo and Controls	262 – 271
Magnet and Magnetism, Dynamo, Working Principle of Dynamo, Parts of Dynamo and Construction, Working of Dynamo, Dynamo Controls, Maintenance of Dynamo, Dynamo Testing, Alternator, Principles of Alternator, Construction and Parts of Alternator, Possible defects and their preventives. Exercise.	
24. Self Starter (Cranking Motor)	272 – 278
Necessity of Self-starter, Working Principles of Self-starter, Working of Self-starter, Self-starter Drive Mechanism, Solenoid Switch, Care and Maintenance of Self-starter, Testing of Self-starter, Possible defects of Self-starter and their preventives. Exercise.	
25. Wiring Circuit and Auxiliary Equipments	279 – 293
Use of Electricity in Modern Motor Vehicles, Wiring Connections, Wiring Circuit, Methods of Wiring, Electric Horn, Wind Screen Wiper Machine, Electrical Side Indicators, Principle of Flasher Unit, Fuel Gauges, Electrical Symbols, Head Light, Construction of Head Lights, Sealed Beam, Head Light Adjusting, Setting of Head Light Focus, Automobile Bulbs, Light Switches, Fuse, Possible defects and preventives of lights. Water Temperature Gauge. Exercise.	
26. Motor Cycle and Scooter	294 – 305
Two Stroke Engine, Four Stroke Motor Cycle Engines, Transmission System, Ignition Timing Setting of Two Stroke Engine, Carburettor, Acceleration of Engine, Chassis Frame, Suspension System. Brakes, Wheels, Main Defects of Motor Cycle and Scooter and their preventives. Exercise.	
27. Engine Faults, Causes, Remedies and Engine Tuning	306 – 311
28. CNG	312 – 318
What is CNG?, Characteristics of CNG vs Petrol, Diesel and LPG, Diesel Vehicle Vs CNG, Changes made to Adopt CNG, Do's and Don't's, Procedure of Locating Leak.	
AUTOMOBILE GLOSSARY	319 – 330