5.1 AUTO ENGINE - II

L	T	P
3	-	6

RATIONALE

This subject is in continuation to Auto Engine-I. It covers diesel engines and other types of engines. It also includes combustion, performance of engine. Engine pollutants and its control. Brief description of engines of modern vehicles has also been included in this subject.

DETAILED CONTENTS

1. High Speed Diesel Engine (10 hrs)

- Theory of diesel engine operation. Difference between petrol & diesel engine. Advantages and disadvantages.
- Fuel filters-primary and secondary; Fuel injection pumps- plunger and barrel type, distributor type; priming of fuel feed pumps, Fuel injectors and solid injection, Common rail direct Injection(CRDI). Type of nozzles, Governing and type of governors.

2. Combustion (08 hrs)

Phenomenon of combustion in C.I engines and S.I engines, phases of combustion and after burning. Methods producing turbulence. Various types of combustion chambers for petrol and diesel engines. Detonation and knocking, octane and cetane number, swirl and squish.

3. Different Types of Engine (11 hrs)

- Super charged engines. Location of super charger, Power absorbed by super charger.
- Turbo charged engines
- Wankel engine
- Gas turbines and jet propulsion
- Alternate fuels operated engines like L.P.G, C.N.G operated,Hydrogen
- Working principle of Hybrid car, fuel cell car/dual fuel operated engines

4. Performance of Engine (06 hrs)

Effect on engine performance due to atmospheric temperature, pressure, compression ratio, engine speed, working conditions, dirt, desert, hills, injection timing/spark timing. Air fuel ratio. Their remedial measures. Two stroke engine scavenging – definition and types.

5. Engine Pollutants and its control (10 hrs)

- Sources of engine pollutants of S.I and C.I engine. Effect of pollutants on human and environment.

- Methods of Control – Crank case ventilation, fuel tank ventilation, carburetion and recirculation. Redesigning of various engine system, V.V.R. Exhaust gas recirculation systems. Catalytic converters. Close loop feedback, electronic integrated engine management system. Emission rules and regulations. Bharat – I, II, III,IV

6. Modern Vehicles (03 hrs)

- Brief description of constructional features of engine used in automobiles such as Hero, Honda, Maruti Suzuki, Tata, Leyland and Volvo trucks.

LIST OF PRACTICALS

1. Dismantling, inspection and assembling of fuel injection pump.
2. Dismantling, inspection and assembling of fuel injector.
3. Dismantling, inspection and assembling of alternator.
4. Dismantling, inspection and assembling of starter motor.
5. Phasing and calibration of fuel injection pump on calibration machine.
6. Gasoline engine Emission test using exhaust gas analyser.
7. Diesel engine Emission test using smokemeter.
8. Study of CRDT engine
9. Servicing of valves and valve-mechanism
10. Identify various electrical components on the mock up wiring board.
11. Removing and refitting head light assembly, head light beam setting.
12. Checking and setting of horn, relay, dipper switch, flasher unit and indicator circuits.

RECOMMENDED BOOKS

1. Automobile Engineering by Dr. Kirpal Singh; Standard Publishers Distributors
2. Automobile Engineering by R.B. Gupta; Satya Parkash, New Delhi
3. I.C. Engines by M.L. Mathur and Sharma; Dhanpat Rai and Sons, Delhi
4. Auto Engines by Halderman and Mitchell; Pearson Publications

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	08	16
3	11	24
4	06	12
5	10	20
6	03	08
Total	**48**	**100**

5.2 CHASSIS, BODY AND TRANSMISSION-II

L	T	P
3	-	6

RATIONALE

Chassis, body and transmission forms the core of automobile engineering. The subject aims at imparting knowledge and skills regarding chassis and body viz, clutch system, transmission system, drive system, steering mechanism, suspension system, braking system and safety of vehicles

DETAILED CONTENTS

1. Suspension System (10 hrs)

Function, types- independent, rigid axle. Suspension springs – functions, construction materials and types (coil spring, leaf spring and torsion bar). Sprung and un-sprung weight, characteristics of spring materials, Types of leaf spring, Leaf spring terminology- spring eye, bushes, leaf sections, rubber pads, pressure blocks, spring cover, interleaf inserters. Variable rate spring, helper spring. Pneumatic suspension system – lay out and working. Function and Construction of hydraulic damper (shock absorber). Diagnosis of common faults and their rectifications

2. Wheel and Tyres (08 hrs)

Wheels – types, constructional detail, material used for wheels. Tyres - classification of tyres, function of tyres. Constructions of pneumatic tyres, composition of covers, tread breaker, bead and casing, comparison of cross-ply and radial-ply tyres. Causes of excessive tyre wear. Tyre care and maintenance. Static and dynamic balancing. Tubeless tyres, Run flat tyres, retreading of tyres. Concept of self inflating tyres.

3. Braking System (08 hrs)

Purpose of brakes, layout of braking system, components, Types of brakes-mechanical, hydraulic, power. Principle of hydraulic brakes, layout, braking action, master cylinder, wheel cylinder, self adjusting brakes, self applying and self releasing action, anti-skid devices, pedal travel, brake enclosures, heat generation and dissipation, Drum brakes-Construction & Working, leading and trailing shoes, Disc brakes- Construction and Working,. Hand brakes, common faults and their rectification.

4. Power Brakes (06 hrs)

Air, air-hydraulic, hydro-vac brakes-their construction, components and working details. Brake fluid and its characteristics, Antilock brake systems. Brake tests, common faults and their rectification.

5. Body fabrication: (08 hrs)

Classification of vehicles according to body. Car body - types of car bodies, body construction type – Body and frame type, Unitised body. Various body panels and their constructional details, Body materials, body painting process.

6. Automotive Safety Systems (04 hrs)

Preventive design, designing for minimum injury in accident, seat belts, air bags, electronic vehicle stability and occupant protection systems, pedestrian protection.

7. Miscellaneous (04 hrs)

History, leading manufacturers of automobiles, their market share, recent developments in automobile industry and automotive components industry in India. Specifications of Chassis and transmission system of a two-wheeler and a four - wheeler

LIST OF PRACTICALS

1. Study and servicing of coil spring type suspension
2. Study and servicing of leaf spring type suspension system
3. Servicing and testing shock absorber
4. Tyre changing practice
5. Retreading of tyres (visit to auto-market)
6. Servicing and overhauling of mechanical brakes.
7. Brake shoe changing practice, brake adjustment.
8. Servicing of hydraulic brakes, bleeding of brakes
9. Wheel balancing – static and dynamic
10. Study of hand brakes
11. Disc pad changing in disc brakes, lubrication of disc brakes.
12. Removing and refitting body parts such as bonnet, front bumper, doors and seats.
13. Practice on body repair.

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of chassis, body and transmission.

RECOMMENDED BOOKS

1. Automobile Engineering, Vol. I – II by Dr. Kirpal Singh, Standard Publishers, Delhi
2. Automobile Engineering by GBS Narang, Khanna Publishers, Delhi
3. Chassis, Body and Transmission by Vijay Singh & Raj Kumar, Ishan Publications, Jalandhar.
4. Chassis, Body and Transmission-II by G.S.Aulakh, Eagle Prakashan, Jalandhar.
5. Automobile Engineering by R.B. Gupta, Satya Prakashan, New Delhi.
6. Automobile Engineering by Vijay Singh & Raj Kumar ; Ishan Publications, Jalandhar.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	20
2	08	16
3	08	16
4	06	12
5	08	16
6	04	10
7	04	10
Total	**48**	**100**

5.3 GARAGE EQUIPMENT

L	T	P
3	-	-

RATIONALE

Management of garages forms an important function of automobile technicians. To perform such functions, knowledge of service station equipment, tuning equipment, engine repair tools, electrical repair equipment and reconditioning and fabrication of equipment is very essential. Hence the subject.

DETAILED CONTENTS

1. Hand Tools/Measuring Tools (08 hrs)

   Classification and Use of

   - Screw drivers
   - Spanners and wrenches
   - Pliers
   - Hammers
   - Chisels
   - Files
   - Hacksaw
   - Taps and dies
   - Reamers
   - Feeler gauge
   - Cylinder dial gauge

2. General Equipment (08 hrs)

   Construction, working and application /use of

   - Bench grinder
   - Air compressor
   - Hydraulic and electric hoists
   - High pressure washing equipment (Car washer)
   - Oil sprayers
   - Grease Guns-manual and bucket type, pneumatic
   - Tyre inflation gauge (Manual and Digital type automatic)
   - Fire extinguisher
   - Contents of First aid box

3. Turning and Testing Equipment (06 hrs)

   Construction, working and application/ use of

   - Vacuum Gauge
   - Compression Gauge (Pressure Gauge)
   - Distributor Tester; cam (dwell) angle tester, r.p.m. tester.
   - Spark plug cleaner and tester
   - Ignition timing light

- Fuel injector tester
- Fuel consumption tester

4. Engine Repair Tools/Measuring and Testing Equipment (08 hrs)

Construction and use of

- Torque wrench, pneumatic wrench
- Piston ring compressor, expander
- Valve lifter and valve spring tester
- Piston ring files, groove cleaner
- Scrappers
- Piston ring remover
- Smokemeter

5. Reconditioning/Testing Equipment for Chassis, Body (06 hrs)

Construction, working and use of

- Brake Efficiency Tester (Chassis Dynamometer) or brake testing equipment
- Jacks – mechanical, hydraulic, trolley type,
- Creeper
- Paint chamber
- Paint Spray Gun
- Paint Drying Equipment
- Spring tester

6. Special Tools (06 hrs)

Construction and use of

- Ridge cutter
- Crank shaft cutter
- Tools for tubes flaring
- Soldering tool
- Nipple forming tool
- Decarbonising kit

7. Body Repair Tool Kit (06 hrs)

Assorted hammers, assorted dollies, body spoons, sanders, pick tools, adjustable file, drip moulding pliers, assorted wrenches, assorted screw drivers, cold chisels, fender beading tools, power tools.

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of garage equipment.

RECOMMENDED BOOKS

1. Automotive Mechanics by WH Crouse and Donald Anglin; and Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Auto Mechanics Fundamentals by MW Stockel, Goodheart Wilcox Publishers.
3. Automobile Engineering Vol. I and II by Dr. Kirpal Singh; Standard Publishers, Delhi.
4. Garage Equipment by G.S. Aulakh, Eagle Prakashan, Jalandhar.
5. Garage Equipment by Raj Kumar, Ishan Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	08	18
2	08	16
3	06	12
4	08	16
5	06	12
6	06	14
7	06	12
Total	**48**	**100**

5.4 AUTO ELECTRICAL AND ELECTRONICS SYSTEMS

L	T	P
3	-	-

RATIONALE

Diploma holders in Automobile Engineering have to deal with different types of batteries, their charging and testing, regulators, ignition system, lighting system and various other electrical accessories used in Automobile Engineering. Hence the subject of automotive electric equipment is very essential for these technicians.

DETAILED CONTENTS

1. Introduction (04 hrs)

   1.1 Various Electrical and Electronics components/systems in Automobile, Functions and uses, earth return system, types of earthing, 6V, 12V system.

2. Batteries (10 hrs)

   2.1 Lead Acid Batteries - Construction, working, elements, types, materials used, electrolyte and its strength, effect of added plate area and temperature, rating, capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging

   2.2 Battery Testing - Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test (voltage)

   2.3 Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging

   2.4 Battery Defects: Sulphation, plates decay, erosion, cracking, sedimentation, separator defects, short circuits, overcharging

   2.5 Alkaline Batteries: Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag-Zn cells, maintenance free batteries

   2.6 Lithium ion battery - Construction and working

   2.7 Fuel cells - Principles of working and uses of fuel cell

3. Charging System (10 hrs)

   3.1 Circuits, function and various components, dynamo and alternator, types, construction, working, advantages and disadvantages of dynamo and alternators, drives, cut out relay

   3.2 Necessity of regulation, construction and working of regulators for dynamos and alternators

4. Starting System (06 hrs)

4.1 Starting requirements of I.C engines, principle, types and construction of starter motor, starter switches, starter drives their types and working

5. Lighting System (08 hrs)

5.1 Various lighting circuits, head lamp, type and constructional details, sealed beam, double filaments, asymmetric and dual units, vertical and side control of lamps, fog light, side light, brake light, instrument light, indicator lights, reversing light, lamp mounting, working indicators LED lighting

5.2 Wiring - HT and LT, their specifications, cable colour codes, wiring Harness, Cable connections, Wiring diagrams of cars and two wheeler, Fuses, faults and rectification

6. Auto Electronics System (05 hrs)

6.1 Concept of ECU, concept of sensor and its application in different systems of vehicle as in fuel supply, ignition system, ABS, steering system

7. Electrical Accessories (05 hrs)

7.1 Temperature gauges, speedometer, wind screen wipers, horns, horn relay, tachometer, heaters, defrosters, Air conditioner, and Electric door locks, window actuation, Seat adjusters.

INSTRUCTIONAL STATREGY

Teachers should lay emphasis on concepts and principles while imparting instructions. As far possible, subject teaching should be supplemented by demonstrations in the laboratory. During practical work, individual students should be given opportunities to perform practicals independently.

RECOMMENDED BOOKS

1. Automobile Engineering by Dr. Kirpal Singh, Standard Publishers, Delhi
2. Automotive Electrical Equipment by P.L. Kohli, Tata McGraw Hill, Delhi
3. Automotive Electrical Equipment by William H. Crouse, Tata McGraw Hill, Delhi
4. Automobile Engineering by Dr. R.B. Gupta, Satya Prakashan, New Delhi
5. Auto Electrical and Electronics Equipments by Ishan Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	10	22
3	10	22
4	06	12
5	08	16
6	05	10
7	05	10
Total	**48**	**100**

5.5 ENVIRONMENTAL EDUCATION

L	T	P
3	-	-

RATIONALE

Education about environment protection is a must for all the citizens. In addition, a diploma holder must have knowledge of different types of pollution caused by industries and construction activities so that he may help in balancing the eco system and controlling pollution by adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Definition, Scope and Importance of Environmental Education (02 hrs)

2. Basics of ecology, biodiversity, eco system and sustainable development (03 hrs)

3. Sources of pollution - natural and manmade, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement (12 hrs)

4. Solid waste management – Causes, effects and control measures of urban and industrial waste (06 hrs)

5. Mining and deforestation – Causes, effects and control measures (04 hrs)

6. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (10 hrs)

7. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) (04 hrs)

8. Current Issues in Environmental Pollution – Global Warming, Green House Effect, Depletion of Ozone Layer, Recycling of Material, Environmental Ethics, Rain Water Harvesting, Maintenance of Groundwater, Acid Rain, Carbon Credits. (07 hrs)

INSTRUCTIONAL STRATEGY

The contents will be covered through lecture cum discussion sessions. In addition, in order to have more appreciation of need for protection of environment, it is suggested that different activities pertaining to Environmental Education like video films, seminars, environmental awareness camps and expert lectures may also be organized.

RECOMMENDED BOOKS

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.

3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
Total	**48**	**100**

5.6 EMPLOYABILITY SKILLS – I

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Writing skills (08 hrs)
   - i) Official and business correspondence
   - ii) Job application - covering letter and resume
   - iii) Report writing - key features and kinds

2. Oral Communication Skills (20 hrs)
   - i) Giving advice
   - ii) Making comparisons
   - iii) Agreeing and disagreeing
   - iv) Taking turns in conversation
   - v) Fixing and cancelling appointments

3. Generic Skills (04 hrs)
   - i) Stress management
   - ii) Time management
   - iii) Negotiations and conflict resolution
   - iv) Team work and leadership qualities

5.7 DRIVING PRACTICE – I

L	T	P
-	-	6

RATIONALE

Driving is an essential part of learning for an Automobile Engineering Diploma holder. Testing of vehicles is not possible unless driving is known. Driving is learnt only by practice on the vehicle. The driving involves knowledge of various aspects of vehicle, safety, traffic rules and regulations. So, provision of imparting driving skill has been made.

DETAILED CONTENTS

1. Identification of various controls of vehicle.
2. Knowledge of general road safety, personal safety, traffic rules and driving regulations.
3. Pre-driving checks:- before sitting on the driver seats, after sitting on the driver's seat.
4. Starting the engine and warming up,
5. Precautions before and after moving the vehicle.
6. Operation of engaging and disengaging the clutch.
7. Gear changing from low to high and high to low.
8. Braking and use of brakes on the road, stopping distance and following distance.
9. Road and traffic signals.
10. Driving practice on road for steering control.
11. Inside and outside inspection/checking of vehicle
12. Checking of engine oil, horn, starter, coolant and battery
13. Driving practice inside the institution or nearby.

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview; Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene