

## 6.1 AUTO REPAIR, MAINTENANCE AND DRIVING PRACTICE - II

L T P Cr  
- - 8 4

### RATIONALE

A diploma holder in Automobile Engineering should have reasonable practice on fault diagnosis with the help of latest machines like engine analyzer etc. Stress has also to be laid on the use of exhaust gas analyzer and other machines for the maintenance of automobile e.g. for wheel balancing and wheel alignment. Student should also be proficient in driving and in maintenance of vehicle. Hence this subject.

### LIST OF PRACTICALS

- 1 -6 Trouble Shooting of Engine: Diagnosing and rectifying the following troubles  
Engine overheating, high oil consumption, engine noises and knocks, high fuel consumption, starter turns the engine but engine doesn't start, engine fires but dies out, engine misfire, lack of power, poor acceleration, engine produces black and white smoke; use of computerized engine analyzer, exhaust gas analyzer. Bringing exhaust gas contents within emission norms.
7. Engine testing and find out all parameters using computerized analyzer
8. Emission test using exhausts gas analyzer
9. Decarbonising brushes and tools, decarbonising of engine - removing carbon deposits from engine combustion chamber, piston crown, valve parts.
10. Valve servicing:  
Refacing, seat reconditioning lapping testing, replacing worn out parts and tappet adjustment.
11. Reconditioning of engines - Measuring of bore for wear and ovality, servicing the cylinder bore, replacing of piston and piston rings.
12. Inspection of crank shaft – bearing replacement and setting of journal bearing. Big– end bearings and crank shaft bearings, measuring bearing clearances by gauges.
13. Servicing of valves and valve mechanism – Replacement of valves, valve seats. valve guides, checking and replacement of defective springs, refacing of valves, tappet and rocker arm and adjusting valve tappets.
14. Surfacing of cylinder heads, cylinder blocks and manifolds on cylinder head refacing machine.
15. Practice for piston ring removal.

16. Practice on honing cylinder blocks, keeping allowance of clearances.
17. Practice in fitting cylinder liners – sleeving and desleeving.
18. Practice in nozzle grinding and lapping, setting of injection pressure and nature of spray.
19. Practice in bending and nipple forming of fuel pipes.
20. Overhauling of wheel and axles.
21. Overhauling of power brakes. Bleeding of brakes.
22. Practice in brake drum turning, measuring ovality, skimming the brake drum.
23. Tyre retreading. (The students may be taken to a service industry).
24. Practice on wheel balancing
25. Practice on wheel alignment
26. Practice on automatic tyre changers
27. Service of injectors (petrol)
28. Crank shaft regrinding
29. Driving Practice on the road to gain proficiency in driving. 50% of the time should be given to driving.

**Note:**

Visit to automobile or tractor workshop is must at least for two days.

**RECOMMENDED BOOKS**

1. Automobile Engineering by Dr. Kirpal Singh; Standard Publisher, Delhi.
2. Automobile Engineering by Sh. R.B. Gupta; Satya Prakashan, New Delhi.
3. Maintenance and Repair of Motor Vehicle by H.O. Geneva; Dialogue, R-686, New Rajinder Nagar, New Delhi.

## 6.2 MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT

L T P Cr  
4 - - 4

### RATIONALE

A diploma holder in Automobile Engineering is supposed to have knowledge about significance of vehicle accident, accidental vehicle claim procedure from insurance company and about Motor Vehicle Act. Therefore, it is essential to teach them Motor basic principles, essentials and appropriate practices covering Motor Vehicle Act. Besides, knowledge of transport management systems and techniques would also be an asset to him.

### DETAILED CONTENTS

1. Motor Vehicle Act (12 hrs)
 

Motor Vehicle Act - Main Provisions  
Salient features of Motor Vehicle Act, Requisites and formalities for following:

  - Licensing of drivers and conductors of motor vehicles Registration of old and new vehicles
  - Private and commercial vehicle control of transport vehicles
  - Transfer of vehicle - Local and State to State
  - Different forms, application for various uses
  - Traffic offences, penalties and procedures
  
2. Inspection and Fitness of Vehicle (6 hrs)
 

Fitness of vehicle -meaning and purpose, provisions in the act, applications Permit consideration for transport and public service
  
3. Insurance of Vehicles (6 hrs)
  - Meaning of Insurance and its necessity
  - Different types - comprehensive and third party insurance
  - Procedure to get Accidental claim and compensation,
  - Surveyor duties,
  - Relations between company and surveyor
  - Duties of driver in case of accident and injury to a person
  
4. Driving (8 hrs)
  - Principle of Driving
  - Driving procedure
  - Driving precautions

- Driving in abnormal conditions, like hilly area, night, fog, heavy traffic and rain
  - Driving License - purpose, importance and requirements
  - Different types of driving licenses
  - Procedure to get driving license
5. Road Safety (8 hrs)
- Road Signs/signals
  - Traffic rules
  - Imposition of Penalties for violation of rules
  - Act and Articles, Duties of Drivers, Duties of conductor, Duties of Helper towards safety of vehicles/passengers/goods and self
6. Pollution Control (8 hrs)
- Different contents of exhaust gas
  - Prescribed standards for pollution
  - Control of pollution
  - Fuel efficiency
7. Transport Management (16 hrs)
- History of transport with special reference to road transport in India
  - Modes of Road transport
  - Organization- Service station and its functions, General layout of modern service station, Spare parts section and dealership service section, Accounts and books, Different types of cards and their use in maintaining service station records
  - Structure of fleet organization
  - State transport - optimum utilization of fleet, theory of fares/freight
  - Roadworthiness requirement,
  - Maintenance of logbook, History sheet, Causes, and prevention of Road Accident, Analysis of Accident, Economy of replacement, Assessment of used vehicles for sale and purchase, Training of Drivers and Mechanics.
  - Taxation – Structure and formalities relating to calculating and paying the relevant taxes.

### **RECOMMENDED BOOKS**

1. Transport Management Vol. III & IV by Central Institute of Road Transport Pune.
2. Motor Vehicle Act of India (with Latest Amendment).
3. Motor Vehicle Act with Rules by B.S. Kohli.

4. Motor Transportation: Principles and Practices Constantin, Ronald Press Company, New York by WJ Hudson and James'.
5. Transport in Modern India by KP Bhatnagar, Satish Bahadur, DN Aggarwal and SC Gupta.
6. State Motor Vehicle Rules.

#### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	12	18
2	6	10
3	6	10
4	8	12
5	8	12
6	8	12
7	16	26
<b>Total</b>	<b>64</b>	<b>100</b>

### 6.3 PRODUCTION PLANNING AND COSTING

L T P Cr  
4 - - 4

#### RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the planning, scheduling and production control activities in the industry. He is also required to have knowledge about cost estimation of new and repaired components, material management, quality aspects and productivity. Therefore it is essential to teach them above topics.

#### DETAILED CONTENTS

- I. Introduction to Production Planning and Control (2 hrs)
  - Necessity of planning and control.
  - Functions of production, planning and control department Factors determining control procedure.
  - Advantages of PPC
  - Types of production.
  
2. Planning (8 hrs)
  - Forecasting
  - Material planning and allocation
  - Allocation for optimum utilization
  - Break even analysis.
  - Procedure for process planning. Process planning sheet.
  - Calculation of man and machine hours.
  
3. Production Control (8 hrs)
  - Objectives
  - Routing
  - Loading and scheduling
  - Dispatching
  - Follow up
  
4. Inspection and Quality Control (10 hrs)
  - Inspection - Need and Planning for Inspection
  - Types of Inspection
  - Role of Operator and Inspector in Inspection
  - Quality Control and Quality Assurance - Meaning and Need
  - Statistical Quality Control
  - Acceptance Sampling

- Control Charts for variables and Attributes
  - QC tools
5. Standards and Codes (4 hrs)
- National and International Codes
  - Concept, elements, benefits and implementation of Quality Management System (ISO 9000 ) and environmental Management System (ISO 14000), Quality Circles
6. Material Management (6 hrs)
- Importance
  - Storeroom operation, issue and receipt of material Inventory control techniques
  - Material handling equipment
  - Purchase of material
  - Stocking of material
  - Vendor development
  - Make or buy decision
  - FIFO (first in first out)
7. Introduction to Estimating and Costing (2 hrs)
- Meaning and importance of estimating and costing. Difference between estimating and costing. Importance of preparing realistic estimates. Estimating procedures.
8. Elements of Cost and Estimation (12 hrs)
- Terms used in costing
  - Direct materials - components
  - Direct costs e.g. labour, raw material, hired equipment, machines and equipment, components
  - Indirect materials such as lubricants, cotton waste and indirect labour. Overhead expenses - rent of building, office expenses, depreciation and service charges
  - Profits - concepts and requirements
  - Variable and fixed cost, production cost
  - Perception of job/work order
  - Different units of work (Bifurcation as per type, Section etc).
  - Analysis of time – Handling time, preparation time, production cycle time, inspection and dispatch time
  - Computation of charges.
  - Operator charges, supervisory charges, storage charges, components charges, material charges, consumable stores charges, Total charges. Estimation of service charges, overhauling
  - Estimation of machining, casting, forging/welding and fabrication etc.

9. Sales and Marketing (6 hrs)
- Market Trends and Survey
  - Advertising and sales techniques
  - After-sales and service
  - Customer satisfaction
  - Warrantee and its claim procedures
  - Purchasing - various procedures
10. Productivity and Incentives (6 hrs)
- Production, productivity, factors affecting productivity, measurement of productivity and causes of decrease in productivity
  - Incentive, definition and concept. Incentive and productivity relation, types of incentives, financial/non-financial. Individual/group incentives. Pre-requisites and characteristics of good incentive plan

### INSTRUCTIONAL STRATEGY

Efforts should be made to relate process of teaching with direct experiences in the industry. Students should be taken to various industrial enterprises for better conceptualization of specific topics such as production planning, material management, inspection and quality control. Simple problems on costing should be given to students for comprehension

### RECOMMENDED BOOKS

1. Production Estimating and Costing by M. Adithan and B.S. Pabla, Konark Publishers, Delhi
2. Industrial Engineering and Management by T.R Banga, and S.C. Sharma, Khanna Publishers, Delhi
3. Work Study by ILO

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	2	4
2	8	12
3	8	12
4	10	15
5	4	6
6	6	8
7	2	5
8	12	18
9	6	10
10	6	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.4 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P	Cr
4	-	-	4

### RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

### DETAILED CONTENTS

1. Principles of Management (12 hrs)
  - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling
  - 1.2 Organizational Structure, Types, Functions of different departments
  - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment
  - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work
  - 1.5 Introduction to operations management and MIS
  
2. Human Resources Development (03hrs)
  - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
  - 2.2 Recruitment, methods of selection, training strategies and career development
  
3. Wages and Incentives (03 hrs)
  - 3.1 Definition and factors affecting wages, methods of wage payment.
  - 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives to supervisor.
  - 3.3 Job evaluation and merit rating.

4. Human and Industrial Relations (06 hrs)
  - 4.1 Human relations and performance in organization
  - 4.2 Understand self and others for effective behaviour
  - 4.3 Behaviour modification techniques
  - 4.4 Industrial relations and disputes
  - 4.5 Relations with subordinates, peers and superiors
  - 4.6 Characteristics of group behaviour and trade unionism
  - 4.7 Mob psychology
  - 4.8 Grievance, Handling of grievances
  - 4.9 Agitations, strikes, Lockouts, Picketing and Gherao
  - 4.10 Labour welfare schemes
  - 4.11 Workers' participation in management
  
5. Professional Ethics (03 hrs)
  - 5.1 Concept of professional ethics
  - 5.2 Need for code of professional ethics
  - 5.3 Professional bodies and their role
  
6. Sales and Marketing management (08 hrs)
  - 7.1 Functions and duties of sales department
  - 7.2 Sales forecasting, sales promotion, advertisement and after sale services.
  - 7.3 Concept of Marketing.
  - 7.4 Problems of Marketing.
  - 7.5 Pricing policy, break even analysis
  - 7.6 Distribution channels and methods of marketing.
  
7. Labour Legislation Acts (as Ammended on date) (06 hrs)
  - 7.1 Factory Act 1948.
  - 7.2 Workmen's Compensation Act 1923.
  - 7.3 Apprentices Act 1961.
  - 7.4 PF Act, ESI Act

- 7.5 Industrial Dispute Act 1947
- 7.6 Employers State Insurance Act 1948
- 7.7 Payment of Wages Act, 1936
- 8. Entrepreneurship Development (06 hrs)
  - 8.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
  - 8.2 Distinction between an entrepreneur and a manager.
  - 8.3 Project identification and selection.
  - 8.4 Project formulation.
  - 8.5 Project appraisal.
  - 8.6 Facilities and incentives to an entrepreneur
- 9. Environmental Engineering (05 hrs)
  - 9.1 Ecology
  - 9.2 Factory causing pollution
  - 9.3 Effects of pollution on Human health
  - 9.4 Air pollution and control
  - 9.5 Water pollution and control
  - 9.6 Solid waste management
  - 9.7 Noise pollution and its control
  - 9.8 Environmental protection Act at State and National level
- 10. Accidents and Safety (04 hrs)
  - 10.1 Classification of accidents based on nature of injuries, event and place.
  - 10.2 Causes and effects of accidents
  - 10.3 Accident-prone workers
  - 10.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
  - 10.5 Safety consciousness and publicity
  - 10.6 Safety procedures
  - 10.7 Safety measures - Do's and Don'ts and good housing keeping

11. Materials Management (4 hrs)  
Inventory control models, ABC Analysis, Safety stock, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, Bin card, Cardex, Material handling techniques
12. Financial Management (4 hrs)  
Importance of ledger and cash book, Profit and loss Account, Balance sheet, Interpretation of Statements, Project financing, Project appraisal, return on investments

### RECOMMENDED BOOKS

1. Industrial Engineering and Management by O.P.Khanna; Dhanpat Rai and Sons, Delhi
2. Industrial Organization and Management by Tara Chand; Nem Chand and Brothers; Roorkee.
3. Marketing Management by Phillip Kotler; Prentice Hall of India, New Delhi
4. Environmental and Pollution Awareness by BR Sharma; Satya Prakashan, New Delhi.
5. Industrial Organisation and Engineering Economics by Banga and Sharma; Khanna Publishers, Delhi.
6. Industrial Management by C.L. Mahajan; Saluja Parkashan, New Delhi.
7. Management by Jams A Stoner, R Edward Freman and Daniel R. Gilbrat, JR, Sixth Edition, Pearson Education, New Delhi
8. Industrial Management by VK Sharma, OP Harkut
9. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
10. Handbook of Small Scale Industry by P.M. Bhandari.
11. Principles of Management by Philip Kotler, TEE Publication.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	3	5
3	3	5
4	6	10
5	3	5
6	8	12
7	6	10
8	6	10
9	5	8
10	4	5
11	4	5
12	4	5
<b>Total</b>	<b>64</b>	<b>100</b>

**ELECTIVE****6.5.1 CONSTRUCTION AND HEAVY EARTH MOVING EQUIPMENT**

L	T	P	Cr
4	-	-	4

**RATIONALE**

A diploma holder in Automobile Engineering has to deal with repair and maintenance of heavy duty vehicles. The subject provides basic understanding of such special vehicles

**DETAILED CONTENTS**

1. Earth Moving Equipment (30 hrs)
 

Function, classification, applications and constructional features of the following earth moving machinery: Excavators, scrapers, rippers, draglines, graders, shovels, trailers, loader, dozers. Equipment used - drills, rippers, crushers, feeders, compressors, snow removers, tractor types. Difference in each type of engine used, features of clutch, power transmission, track chains, sprockets, springs and blades.

Study of working principals and design considerations of different systems involved like power system, transmission, final drive, lubrication, electrical system, braking, steering and pneumatic and hydraulic control circuits of earth moving equipment
2. Hoisting Equipment (10 hrs)
 

Description of hoist winch, part lines, hoisting chains, slings, fork-lift truck, cranes (hand operated type electric overhead travelling type), Jacks (hydraulic, mechanical), bucket elevators. Factors affecting the selection of hoisting equipment
3. Rollers (8 hrs)
 

Types of rollers, type of engines used for rollers. Chassis, power transmission, steering, braking and other features
4. Pneumatic Equipment (10 hrs)
 

Function and salient features of pneumatic tools-rock drills, hammers, chippers. Air operated grease gun and spray gun
5. Calculation of hire charges for various types of earth moving equipment (6 hrs)

## INSTRUCTIONAL STRATEGY

Visits to construction sites should be organized for better understanding of concepts and principles. It is important to make use of audio-visual aids/video films to support the instructional material

## RECOMMENDED BOOKS

1. Construction Equipment by Mahesh Verma
2. Construction Equipment by Jagman Singh
3. Construction Equipment Operation and Maintenance by Y Pokras and M Tushnyakov, Mir Publishers, Moscow
4. Hand Book of Earth Moving Machinery by Central Water and Power Commission (Government of India)

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	30	45
2	10	15
3	8	15
4	10	15
5	6	10
<b>Total</b>	<b>64</b>	<b>100</b>

**ELECTIVE**  
**6.5.2 AUTOMOBILE BODY**

L	T	P	Cr
4	-	-	4

**RATIONALE**

Automobile body is very important aspect of management/operation of vehicles. Basic knowledge to diploma students of automobile body is significant as they have to deal with the manufacture and upkeep of auto body especially accident repair. Hence the subject.

**DETAILED CONTENTS**

- |    |   |          |
|----|---|----------|
| 1. | Auto Body   | (8 hrs)  |
|    | 1.1 Introduction  |          |
|    | 1.2 Main features and function of body  |          |
|    | 1.3 Body requirements   |          |
|    | 1.4 Types, shapes – car, jeep medium and heavy truck, half body, articulated                  |          |
|    | 1.5 Design principles   |          |
|    | 1.6 Frame construction – tabular, interlaced, channel section, car frame, truck frame, ladder |          |
| 2. | Body Structure  | (12 hrs) |
|    | 2.1 Frameless construction  |          |
|    | 2.2 Integral construction   |          |
|    | 2.3 Semi unitary or Endo – Skeleton   |          |
|    | 2.4 Unitary with sub-frame  |          |
|    | 2.5 Car body paneling   |          |
|    | 2.6 Special purpose bodies  |          |
|    | 2.7 Passenger and luggage requirements, all metal bodies, coach built bodies                  |          |
|    | 2.8 Auto floors, cowl assembly, front end assembly, roof assembly, doors and door fittings    |          |
| 3. | Body Material   | (12 hrs) |
|    | 3.1 Requirements of body materials, safety consideration                                      |          |
|    | 3.2 Types of materials and their specifications   |          |
|    | 3.3 Timber – ply wood, fibre, boards  |          |
|    | 3.4 Steel, MS – Angle, channel, strips  |          |
|    | 3.5 Aluminium alloys – sheets, strips, channels   |          |
|    | 3.6 Glass – coloured glass, toughened, fibre reinforced                                       |          |
|    | 3.7 General parts like door handles, hinges, latches, locks                                   |          |
|    | 3.8 Plastics, fibre glass   |          |

4. Seating and Upholstery (12 hrs)
- 4.1 Importance/need of seats
  - 4.2 Types of seats
  - 4.3 Seat designs/contours
  - 4.4 Rigidity and comfort
  - 4.5 Adjusting mechanisms
  - 4.6 Seat making
  - 4.7 Seat materials – rubber/foam/jute, mats/springs, sutri
  - 4.8 Seating clothes – cotton, rexin, leather
  - 4.9 Seat covers and colours
  - 4.10 Correct upholstery, curtains and curtain materials
  - 4.11 Maintenance/cleanliness of seat and items of upholstery
  - 4.12 Interior fitting – covers/mats, decoration, electrical fittings
5. Safety Standards (8 hrs)
- Safety standards regarding
- a) Anchorage
  - b) Instruments/controls
  - c) Window shields, glass, wipers
  - d) Doors, windows, roofs
  - e) Head rests
  - f) Safety belts
  - g) Anti braking system
  - h) Modern safety systems
6. Body Maintenance and Accident Repairs (12 hrs)
- 6.1 Periodic maintenance for nuts/bolts/latches and moveable parts
  - 6.2 General body repairs, replacement of panels and damaged portions; denting, systematic preparatory work, ironing of dents, finishing and patching, welding, soldering. General and special tools/equipment for repair work

### **INSTRUCTIONAL STRATEGY**

Industrial visits to some automobile body building units should be planned for better conceptualization. It is important to make use of audio-visual aids/video films to support the instructional material

**RECOMMENDED BOOKS**

1. Automobile Engineering Vol. 1 by Dr. Kirpal Singh, Standard Publishers, Delhi
2. Automotive Chassis and Body by WH Crouse; McGraw Hill Book Company, New Delhi
3. Automobile Engineering by Anil Chikara, Satya Prakashan Publications, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	8	12
2	12	20
3	12	18
4	12	20
5	8	12
6	12	18
<b>Total</b>	<b>64</b>	<b>100</b>

**ELECTIVE**  
**6.5.3 TRACTOR AND AGRICULTURE IMPLEMENTS**

L T P Cr  
 4 - - 4

**RATIONALE**

Diploma holders in Automobile Engineering may have to deal with repair and maintenance of tractors and agriculture implements. This subject provides knowledge about such vehicles and equipment

**DETAILED CONTENTS**

1. Tractor (10 hrs)  
 Classification of tractors, functions of farm tractors, application of tractors, types of engine used, main tractor assemblies, power requirement, basics trends in tractor design, forces acting on a tractor on move, parallel pull, rolling resistance, tractor stability and weight distribution
2. Hydraulic System (10 hrs)  
 Functions of hydraulic system, components of hydraulic system, method of attaching implements, classification of hydraulic controls for hitches, integral hitch system, draft control system. Position control and Mixed control
3. Tractor Chassis (10 hrs)  
 Salient features of engine, clutch, power transmission, final drive, brakes and steering of Indian tractors.
4. Supplementary System (8 hrs)  
 Power take off shaft, draw bar working, belt pulley traction control unit, three point linkages
5. Tractor Wheels and Tyres (6 hrs)  
 Salient features of wheels, tyres and wheel base/wheel tracks. Specifications of wheels and tyres, dual versus tendum tyres, tread design, effect of tyre inflation. Prominent Indian made tractor specifications, maintenance and operation of tractors

6. Agricultural Implements (10 hrs)

Types of agriculture equipment - trailed and mounted types. Description and working principles of ploughs, mould board plough, disc plough, cultivator, reaper, winnowers, binder, trasher trailer, seed drill pumps and sprayers

7. Repair and Maintenance (10 hrs)

Faults and their rectification of tractor and agricultural implements, maintenance of tractor and agriculture implements

### **INSTRUCTIONAL STRATEGY**

Visits to some tractor assembling industry or agriculture implements manufacturing units should be organized for better understanding of concepts and principles. It is important to make use of audio-visual aids/video films to support the instructional material

### **RECOMMENDED BOOKS**

1. Farm Machines and Equipment by CP Nakra; Dhapat Rai and Sons, New Delhi
2. Manual of Tractors by J Konard, Asia Publishing House
3. Tractors and Agriculture Equipment by Jain and Roy

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	10	15
2	10	15
3	10	15
4	8	15
5	6	10
6	10	15
7	10	15
<b>Total</b>	<b>64</b>	<b>100</b>

**ELECTIVE****6.5.4 AUTOMOTIVE HEATING AND AIR CONDITIONING**

L	T	P	Cr
4	-	-	4

**RATIONALE**

Human comfort has gained priority in latest developments in automobile field. Automobile heating and air conditioning is now forming part of new technology vehicles. A diploma holder in automobile engineering must know the basics of heating refrigeration and air conditioning and their applications, hence this subject.

**DETAILED CONTENTS**

1. Ventilation and Heating System (8 hrs)  
Automotive ventilation system, layout of heating system, heating system components – their construction and working
2. Air-Conditioning System (10 hrs)  
Layout of a car air- conditioning system. Main constituents viz. refrigeration, air circulation and controls, their functions and working
3. Refrigeration System (12 hrs)  
Various components – types, construction and working of compressor, electromagnetic clutch, condenser, receiver – dryer, thermostatic expansion valve, and evaporator
4. Control System (8 hrs)  
Air distribution and circulation system, blend-air, electronic and thermostatic methods of temperature control
5. Inspection and Testing (8 hrs)  
Visual inspection, testing equipment and methods of leak testing
6. Trouble Shooting (10 hrs)  
Diagnosing major faults in automotive air conditioning system. Use of technical manuals
7. Service and Precautions (8 hrs)

Procedures for flushing, evacuating and charging the system. General and refrigerant safety precautions. Servicing tools and equipment

Note: Various components such as evaporator, condenser, thermostatic valve, receiver-dryer electromagnetic clutch, compressors, piping and hoses should be demonstrated during teaching. The air conditioning systems for bus and car should be shown to students.

### **INSTRUCTIONAL STRATEGY**

Teacher should lay emphasis on concepts and principles related to heating system and air conditioning of automobiles. It is important to make use of audio-visual aids/video films to support the recommended materials.

### **RECOMMENDED BOOKS**

1. Automotive Air Conditioning by Boyce H. Dwiggin; Delmar Thomson Publishers
2. Automotive Air Conditioning by Crouse and Donald Anglin; McGraw Hill Book Company
3. Automotive Principles and Service by Theissen and DN Dales; Prentice Hall

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	8	12
2	10	16
3	12	20
4	8	12
5	8	12
6	10	16
7	8	12
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.6 PROJECT WORK

L	T	P	Cr
-	-	12	6

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 3-4 students.

- Projects related to repair and maintenance of automobiles
- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with repair and maintenance
- Projects related to identification of raw material thereby reducing the wastage
- Any other related problems of interest of host industry

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.