

5.1 DESIGN OF AUTOMOTIVE PARTS

L T P
Periods per week 5 - -

RATIONALE

Understanding of basic design principles of components like cylinder liner, piston, crank shaft, connecting rod, simple mechanisms, etc are essential for Diploma holders in Automobile Engineering, hence this subject.

DETAILED CONTENTS

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1. Introduction
Review of the working principle of automobiles, Design consideration, General Procedure of design | 10 periods |
| 2. Designing of I C Engine Parts
Design of engine cylinder, piston and connecting rod | 20 periods |
| 3. Design of power transmission systems
Types of gear drives, Design of spur gear and helical gears, Strength of gear teeth. Lewis equation- Dynamic tooth load. | 20 periods |
| 4. Design of clutches
Types of clutches, Design of single plate & Multi plate clutch, Uniform Pressure & Uniform wear Theory | 15 periods |
| 5. Design of flywheels
Function of flywheel, Fluctuation of speed and energy for fly wheel, Turning moment diagrams with reference to internal combustion engines, Design of flywheel | 15 periods |

INSTRUCTIONAL STRATEGY

Teacher should lay emphasis on conceptual understanding and design aspects of various parts/ components. Various models should be demonstrated in the class to explain mechanism

RECOMMENDED BOOKS

1. Machine Design- Fundamentals and Practices, by P C Gope, PHI Learning Pvt Limited, New Delhi
2. A Text Book of Machine Design by RS Khurmi & J KGupta, Eurasia Publishing House, Pvt. Ltd, New Delhi
3. Introduction to Machine Design by VB Bhandari, TMH, Delhi
4. Theory of Machines by PL Ballaney, Khanna Publishers, New Delhi
5. Theory of Machines by DR Malhotra & HC Gupta, Satya Prakashan, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Periods allotted (Period)	Marks Allotted (%)
1	10	15
2	20	25
3	20	25
4	15	15
5	15	20
Total	80	100

SUGGESTION

5.2 HYDRAULIC AND PNEUMATIC CONTROL SYSTEMS

	L	T	P
Periods/week	4	-	2

RATIONALE

In the era of advances in control system in automotives, hydraulic and pneumatic control systems are very popular. Special purpose vehicles are equipped with such systems. It is necessary to give students exposure of control system. This subject will help them to familiarize with basic requirements, concepts and constructional features of control systems in general.

DETAILED CONTENTS

- 1. Introduction** 10 Period
Fluid properties, Density, Specific Weight, Specific Gravity, Viscosity, Continuity equation, Concept of datum, pressure, velocity and total head of a fluid particle in motions, Bernoulli's theorem and its equation. Simple problems based on use of formula only.
- 2. Flow Measurement** 12 Period
Venturimeter, Orifice meter, Pitot tube, their working principle, constructions and formula for discharge measurement, practical applications of above meters, Simple problems based on use of formula only.
- 3. Pressure Measurement** 12 Period
Concept of pressure, intensity of pressure, pressure head, gauge pressure, vacuum pressure, absolute pressure, manometer, simple U-tube manometer, differential manometer, Simple numerical problems based on use of formula only.
- 4. Hydraulic pumps** 10 Period
Centrifugal and reciprocating pumps, their principle construction, working, classification and layout, their comparison, specific speed, Formula for horse power and efficiency of centrifugal pump. Simple numerical problems based on use of formula only.
- 5. Hydraulic Control Systems** 10 Period
Purpose, function, layout of simple hydraulic system, components viz pump motor, pressure regulator, fluid filter, control valve, cylinder, pipes and hoses, linear/rotary actuators piston pump, Comparison of different types of pumps.
- 6. Pneumatic Control System** 10 Period
Pneumatic system components, air filter, compressor, air treatment unit, reservoir, on /off control valve, pressure regulator air control valve, actuators, types of linear actuators, single rod single acting, single rod double acting, double rod double acting, comparison of pneumatics system with hydraulics system.

LIST OF PRACTICALS

1. Measurement of pressure by U Tube Manometer
2. Measurement of Discharge by Venturimeter
3. Measurement of Discharge by Orifice meter
4. Study of construction & working of single acting reciprocating pump
5. Study of construction & working of Centrifugal Pump
6. Study of construction and working of Hydraulic Control System
7. Study of various types of oil pumps
8. Study of construction and working of Pneumatic Control System

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose the students to real life problems.
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills.

RECOMMENDED BOOKS

1. Fluid Mechanics & Hydraulics Machines by Dr. R.K. Bansal
2. Fluid Mechanics & Hydraulics Machines by Modi and Seth
3. Fluid Mechanics & Hydraulics Machines by Jagdish Lal
4. Fluid Mechanics & Hydraulics Machines by A.K. Jain
5. Refrigeration's & Air conditioning by R.S. Khurmi
6. Fluid power and trouble shooting by Hohn A.H.
7. Fluid power theory and application by James A Sullivan
8. Pneumatic control and system by Mazumdar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	15
2.	12	20
3.	12	20
4.	10	15
5.	10	15
6.	10	15
Total	64	100

5.3 EARTH MOVING EQUIPMENTS

L T P
Periods/week 5 - -

RATIONALE

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

DETAILED CONTENTS

- 1. Tractors** 14 periods
History & development of tractors, Manufacturers in India, Uses of tractors, Types of tractors, Lubrication system, Cooling system, Transmission system, Power take off shaft, steering system, Types of tyres, Tractors braking system
- 2. Construction Equipments** 16 periods
Function, classification, constructional features and applications of the following earth moving machinery: Dumper, Excavator, Scraper, Ripper, Dragline, Grader, Shovel, trailer, Loader, Dozer, Snow remover.
- 3. Dozers** 10 periods
Introduction, Types of dozers, various components of Dozers, transmission in dozers, suspension system.
- 4. Rollers and Compactors** 14 periods
Introduction, types of rollers, various manufacturers in India, Transmission System, steering system, Braking system, Applications.
- 5. Hoisting Equipment** 14 periods
Description of hoist winch, hoisting chains, slings, fork-lift truck, cranes (hand operated type electric overhead travelling type), Jacks (hydraulic, mechanical), bucket elevators
- 6. Pneumatic Equipment** 12 periods
Function and salient features of pneumatic tools-rock drill, hammer, chipper. Air operated grease gun and spray gun

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 & its planning & applications by Mahesh Varma, Metropolitan Book Company, New Delhi
2. Hand Book of Earth Moving Machinery by Central Water and Power Commission
3. Construction Equipment Operation and Maintenance by Y Pokras and M Tushnyakov, Mir Publishers, Moscow
4. Heavy Construction Planning Equipment & Methods by Jagman Singh, Oxford & IBH Publishing Co., New Delhi
5. Construction Equipment Operation and Maintenance by Y Pokras and M Tushnyakov, Mir Publishers, Moscow

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Period)	Marks Allotted (%)
1	14	20
2	16	25
3	10	15
4	14	14
5	14	16
6	12	10
Total	80	100

5.4 AUTO ENGINEERING DRAWING

L T P
Periods/week 4 - 4

RATIONALE

An Automobile Engineering diploma holder, irrespective of his field of operation in an industry or transport undertaking, is expected to possess a thorough understanding of engineering drawing, which includes clear spatial visualization of the subject and the proficiency in reading and interpreting a wide variety of drawings. Besides this, he is also expected to have a certain degree of drafting skills depending upon his job functions to perform his day-to-day activities e.g. communicating and discussing the ideas with his superiors and passing on instructions to his subordinates in an unambiguous way. The teachers are recommended to lay emphasis on showing automobile components to students..

DETAILED CONTENTS

Assembly Drawings of the following automotive components:

- | | | |
|----|----------------------------------------------------------------------------------|-----------|
| 1. | Joints | 12 period |
| | <input type="checkbox"/> Cotter Joint | |
| | <input type="checkbox"/> Knuckle Joint | |
| | <input type="checkbox"/> Universal joint | |
| 2. | Engine Components (Free hand sketches) | 12 period |
| | <input type="checkbox"/> Piston | |
| | <input type="checkbox"/> Connecting rod | |
| | <input type="checkbox"/> Crank shaft | |
| | <input type="checkbox"/> Spark Plug | |
| 3. | Gears | 16 period |
| | <input type="checkbox"/> Nomenclature of gears | |
| | <input type="checkbox"/> Profile of spur gear by 'Approximate method' | |
| | <input type="checkbox"/> Profile of spur gear by 'Unwin's Method' | |
| 4. | Cam Profile | 12 period |
| | <input type="checkbox"/> Different types of cams and followers | |
| | <input type="checkbox"/> Drawing of cam profile for following motion of follower | |
| | a. Uniform velocity motion | |
| | b. Simple harmonic motion (SHM) | |
| | c. Uniformly accelerated and retarded motion | |
| 5. | Coupling | 12 period |
| | Flange coupling, muff coupling. | |

INSTRUCTIONAL STRATEGY

Teacher should make use of models while explaining the details of drawing of various automobile parts and components. Emphasis should be laid on cleanliness and quality of drawings.

RECOMMENDED BOOKS

1. Auto Engineering Drawing by RB Gupta; Satya Parkashan, New Delhi
2. Automobile Engineering Drawing by Raj Kumar, North Publication, Jalandhar
3. Machine Drawing by PS Gill; BD Kataria and Sons, Ludhiana
4. Machine Drawing by Lakshminarayan; Jain Brothers, New Delhi
5. Automobile Engineering- Vol. I and II by Dr. Kirpal Singh, Standard Publishers Distributors, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Periods)	Marks Allotted (%)
1	12	20
2	12	20
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4	12	20
5	12	20
Total	64	100

5.5 FAULT DIAGNOSIS AND DRIVING PRACTICES

L T P
Periods/week - - 10

RATIONALE

Now, as the students have learnt about the engines, chassis, body, transmission, auto electrical and electronics systems and garage equipments, they should be able to test the various automotive parts and accessories as well as diagnosis the various problems relating to them. So emphasis is given to familiarize and practice about fault diagnosis and testing.

DETAILED CONTENTS

1. Basic electrical checks – Battery connections, electrical bulbs and units, circuit protection devices and wiring connections
2. Testing of battery – Specific gravity test, high rate discharge test, open circuit voltage test, charging of battery
3. Testing and setting of ignition timing, cam angle
4. Testing of field winding of alternator and armature of starter motor for open circuit, short circuit and earthing
5. Engine testing and finding out fuel consumption
6. Diagnosing battery ignition system
7. Diagnosing and rectifying high oil consumption
8. Diagnosing and rectifying high fuel consumption
9. Diagnosing and rectifying engine noises and knocks
10. Diagnosing and rectifying engine starting troubles
11. Diagnosing and rectifying engine running faults
12. Diagnosing and rectifying engine overhauling
13. Measuring of bore for wear, ovality and taperness
14. Inspection of crankshaft – bearing replacement and setting of journal bearings, crank pin bearings and crank shaft bearings, measuring bearing clearances by gauges
15. Demonstration of body repair techniques

INSTRUCTIONAL STRATEGY

Visits to Service centres 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. Automobile Engineering Vol 1 & 2 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
4. Automotive Mechanics by William H. Crouse, Tata McGraw Hill, Delhi

5.6 CAD IN AUTOMOBILE ENGINEERING

L T P
Periods/week - - 10

RATIONALE

Competency in computer aided drafting is essential for diploma holders in Automobile Engineering. Hence this subject is required.

DETAILED CONTENTS

1. Introduction to AutoCAD

- 1.1 Introduction to AutoCAD. Setting the drawing environment: Limits, Grid, Snap, Axis, Units, Ortho, Co- Ordinates ON, OFF Units and Color
- 1.2 2D Drawing entities - Point - Line - Arc - circle, Ellipse, Polygon, and Trace. Object
- 1.3 Editing commands: Selection of entities by different methods - copy, Move, Scale, Rotate, Fillet, Chamfer, Mirror, Array-Polar, Rectangular. Measure, Divide, and Erase. Drawing Display Methods: Zoom, Pan, and View
- 1.4 Drawing Display Methods – Zoom, Pan, and View
- 1.5 Adding Texts and Dimensions: Text, Dimension-linear, continued, angular
- 1.6 Working on multiple layers, Layer concepts in Auto CAD –Various options with layer command - Hatch command - Creating line types, library and user made library
- 1.7 Preparing the schematic drawing of a workshop building in one layer, the blocks of machines in another Layer and Electrical connection on another layer

2. Drawing of 2D views of following automotive components using AutoCAD (Any Six sheets)

- V – belt pulley
- Stepped cone pulley
- Ball bearing
- Sectional front view of screw jack
- Spur gear
- Poppet valve
- Wheel cylinder (sketch)
- Valve tappet
- Piston
- Semi-elliptic leaf spring
- Internal expanding shoes brake (sketch)

3. Introduction to 3D features of AutoCAD

INSTRUCTIONAL STRATEGY

1. Teachers should demonstrate use of AutoCAD, while teaching..
2. Emphasis should be given on dimensioning and layout of sheet.
3. Teacher should ensure use of IS Codes related to drawing.

RECOMMENDED BOOKS

- 1 AutoCAD by Shyam Tickoo, Dream Tech. Publication, Delhi
- 2 Computer Aided Drafting – Auto CAD; ISTE Nomogram, Delhi

SUGGESTION