



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 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

- |   |            |
|---|------------|
| <b>1. Introduction</b>  | 10 periods |
| Review of the working principle of automobiles, Design consideration, General Procedure of design   |            |
| <b>2. Designing of I C Engine Parts</b>   | 20 periods |
| Design of engine cylinder, piston and connecting rod  |            |
| <b>3. Design of power transmission systems</b>  | 20 periods |
| Design of flat belts, Ratio of tension of two sides of the belt with and without centrifugal tension, Horse power transmitted and condition for maximum horse power transmitted. Types of gear drives, Design of spur gear and helical gears, Strength of gear teeth. Lewis equation- Dynamic tooth load. |            |
| <b>4. Design of clutches</b>  | 15 periods |
| Types of clutches, Design of single plate & Multi plate clutch, Uniform Pressure & Uniform wear Theory  |            |
| <b>5. Design of flywheels</b>   | 15 periods |
| Function of flywheel, Fluctuation of speed and energy for fly wheel, Turning moment diagrams with reference to internal combustion engines, Design of flywheel  |            |

### 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



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 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
<b>Total</b>	<b>80</b>	<b>100</b>



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 5.2 FUELS AND LUBRICANTS

L T P

Periods per week 4 - 2

### RATIONALE

This subject is introduced with the intention to provide in-depth knowledge about combustion process, knocking & fuels, rating & standards, for fuel as well as lubricating oil, greases, brake fluids, & their characteristics. Rating & standards for lubricants which is expected from diploma holders as an automobile expert.

### DETAILED CONTENTS

- 1. Introduction to Automotive Fuels** 08 Periods  
Sources and properties of petroleum fuels Gasoline, Diesel, LPG, CNG, alcohols etc.
- 2. Fuels for Gasoline Engines** 10 Periods  
Process of combustion in Gasoline Engines, knocking in gasoline engines, Highest Useful Compression Ratio, Octane number, factors responsible for knocking, methods to reduce knocking, delay period of fuels, ignition advance, flame propagation, factors affecting flame propagation, Anti knock agents, effect of high octane number fuels on engine, properties of gasoline, formation of gum, ISI standards for gasoline's, important characteristics of gasoline
- 3. Fuels for Diesel Engines** 10 Periods  
Process of combustion in Diesel Engine, Comparison of Diesel combustion with petrol combustion, Diesel knock, Delay period factors responsible for diesel knock, difference between diesel and petrol knock. Doped fuel, properties of Diesel fuels, ISI standards for Diesel fuels.
- 4. Alternative Fuels** 06 Periods  
Introduction, Gasohol, methyl alcohol, L.P.G., C.N.G, Bio-diesel their important properties and specific advantages over conventional fuels.
- 5. Lubricating Oils** 10 Periods  
Introduction, functions of lubricating oil, properties of lubricating oils such has viscosity, resistance to carbon formation, resistance to oil oxidation, corrosion and rust resistance, foaming resistance, Detergent dispersants, Extreme pressure resistance. Viscosity index, viscosity numbers, multiple viscosity oils, synthetic oils, sludge formation in oils, prevention of sludge formation. Service rating of oil, ISI standards for automotive lubricants, S. A. E. rating of various oils.
- 6. Greases** 08 Periods  
Introduction, composition and formation, properties of greases, field of applications, classification of greases such as wheel bearing greases, universal joint greases, chassis greases, multipurpose greases, extreme pressure greases, service rating of greases, ISI standards for various automotive greases. S. A. E. rating of various greases.



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

7. **Brake Fluids** 06 Periods  
Introduction, characteristics of good brake fluid, service rating of brake fluid, ISI standards for brake fluids.
8. **Gearbox Lubricants** 06 Periods  
Introduction, function of lubricant, composition of lubricants, service ratings, ISI Standards and SAE Ratings.

## LIST OF PRACTICALS

1. To determine the flash point of given petroleum fuel.
2. To determine the fire point of given petroleum fuel.
3. To determine the viscosity of given lubricant.
4. To determine the pour point of given lubricant.
5. To plot the fuel evaporation characteristics for given petroleum fuel.

## INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of Fuels & Lubricants. Demonstration should be made in the automobile shop to explain various aspects of Fuels & Lubricants.

## RECOMMENDED BOOKS

1. Automotive Mechanics by W. H. Crouse
2. Internal Combustion Engines by Sharma and Mathur
3. Automobile Engineering by R. B. Gupta
4. Automobile Engineering Vol I and II by K. M. Gupta
5. Fuels and Lubricants by A. Lahiri
6. Lubricants and Lubrication by S, N, Sadhu and Sher Singh

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Period)	Marks Allotted (%)
1	08	10
2	10	20
3	10	20
4	06	10
5	10	10
6	08	10
7	06	10
8	06	10
<b>Total</b>	<b>64</b>	<b>100</b>



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 5.3 GARAGE EQUIPMENT

L T P  
Periods/week 5 -

### 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** 13 Periods  
Classification and Use of
  - Screw drivers
  - Spanners and wrenches
  - Pliers
  - Hammers
  - Chisels
  - Files
  - Hacksaw
  - Tools for tubes flaring
  - Taps and dies
  - Reamers
  - Feeler gauge
  - Cylinder dial gauge
  
2. **General Equipment** 13 Periods  
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** 10 Periods  
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



## संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

- Fuel injector tester
  - Fuel consumption tester
4. **Engine Repair Tools/Measuring and Testing Equipment** 13 Periods  
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
  - Smoke meter
5. **Reconditioning/Testing Equipment for Chassis, Body** 10 Periods  
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** 10 Periods  
Construction and use of
- Ridge cutter
  - Crank shaft cutter
  - Tools for tubes flaring
  - Soldering tool
  - Nipple forming tool
  - Decarbonising kit
7. **Body Repair Tools Kit** 11 Periods  
Assorted hammers, assorted dollies, body spoons, sanders, pick tools, adjustable file, drip moulding pliers, assorted wrenches, assorted screw drivers, cold chisels, fender bleeding tool, sanders, power tools

### INSTRUCTIONAL STRATEGY

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



## संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

### RECOMMENDED BOOKS

1. Automotive Mechanics by WH Crouse and Donald Anglin; 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.	Periods allotted (Period)	Marks Allotted (%)
1	13	15
2	13	15
3	10	10
4	13	15
5	10	15
6	10	15
7	11	15
<b>Total</b>	<b>80</b>	<b>100</b>







# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 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
3	16	20
4	12	20
5	12	20
<b>Total</b>	<b>64</b>	<b>100</b>



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 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



# संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

## 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



## संयुक्त प्रवेश परीक्षा एवं प्रशिक्षण, अनुसंधान विकास प्रकोष्ठ देहरादून उत्तराखण्ड

### 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