UTTARAKHAND BOARD OF TECHNICAL EDUCATION

JOINT ENTRANCE EXAMINATION AND TRAINING, RESEARCH DEVELOPMENT CELL, DEHRADUN

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME

BRANCH NAME – AUTOMOBILE ENGINEERING **SEMESTER – V**

Subject Code	Subject	L	T	P	TOT	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs.	Max Marks	Hrs.		
265003	Design of Automotive Parts*	5	-	-	5	30	-	80	2.5	-	-	110	6
295001	Fuels & Lubricants	4	-	2	6	30	20	80	2.5	30	3.0	160	6
295002	Garage Equipments	5	-	-	5	30	-	80	2.5	-	-	110	4
265001	Auto Engineering Drawing*	4	-	4	8	30	20	80	2.5	30	3.0	160	6
265004	Fault Diagnosis and Driving *	-	-	10	10	-	50	-	-	50	3.0	100	5
265002	CAD in Automobile Engineering*	-	-	10	10	-	50	-	-	50	3.0	100	5
295052	Industrial exposure (Assessment at Institute Level)+	-	-	-	-	-	25	-	-	-	-	25	1
295053	Industrial training	4 week				-	50	-	-	160	3.0	210	1
015054	General Proficiency#	-	-	4	4	-	25	-	-	-	-	25	1
Total		**18**	**-**	**30**	**48**	**120**	**240**	**320**	**-**	**320**	**-**	**1000**	**35**

* Common with diploma courses in 5th Sem Mechanical (Automobile) Engineering.

\# General Proficiency will comprise of various co-curricular activities like games, hobby, clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

\+ Industrial visit compulsory at minimum 2 industry or department.

Note: 1- Each period will be 50 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 12.5 weeks.+Industrial Visit

Branch Code - 29

FIFTH SEMESTER
AUTOMOBILE ENGINEERING

DESIGN OF AUTOMOTIVE PARTS

L	T	P
5	-	-

Subject Code : 265003

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 **10 periods**

Review of the working principle of automobiles, Design consideration, General Procedure of design

2. Designing of I C Engine Parts **20 periods**

Design of engine cylinder, piston and connecting rod

3. Design of power transmission systems **20 periods**

Types of gear drives, Design of spur gear and helical gears, Strength of gear teeth. Lewis equation- Dynamic tooth load.

4. Design of clutches **15 periods**

Types of clutches, Design of single plate & Multi plate clutch, Uniform Pressure & Uniform wear Theory

5. Design of flywheels **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

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.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	20	25
3	20	25
4	15	15
5	15	20
Total	**80**	**100**

FUELS AND LUBRICANTS

L	T	P
4	-	2

Subject Code : 295001

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.

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 (Periods)	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
Total	**64**	**100**

GARAGE EQUIPMENT

L	T	P
5	-	-

Subject Code : 295002

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
- 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, asserted 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.

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.	Time Allotted (Periods)	Marks Allotted (%)
1	13	15
2	13	15
3	10	10
4	13	15
5	10	15
6	10	15
7	11	15
Total	**80**	**100**

AUTO ENGINEERING DRAWING

L	T	P
4	-	4

Subject Code : 265001

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**

- Cotter Joint
- Knuckle Joint
- Universal joint

2. Engine Components (Free hand sketches) **12 period**

- Piston
- Connecting rod
- Crank shaft
- Spark Plug

3. Gears **16 period**

- Nomenclature of gears
- Profile of spur gear by 'Approximate method'
- Profile of spur gear by 'Unwin's Method'

4. Cam Profile **12 period**

- Different types of cams and followers
- 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
3	16	20
4	12	20
5	12	20
Total	**64**	**100**

FAULT DIAGNOSIS AND DRIVING

L	T	P
-	-	10

Subject Code : 265004

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

CAD IN AUTOMOBILE ENGINEERING

L	T	P
-	-	10

Subject Code : 265002

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

IMPLEMENTATION

LEARNING OUTCOMES

ASSESSMENT

IMPACT

LEARNING OUT COMES AND MEANS OF ASSESSMENT

BRANCH NAME – AUTOMOBILE ENGINEERING **SEMESTER – V**

S.N0.	Title of Subject/Unit	Learning Outcomes	Means of Assessment
1	Design Of Automotive Parts	After successful completion of this course, students will be able to 1. Know general procedure of design. 2. Design I.C Engine Parts like Cylinder, Piston and Connecting Rod. 3. Design Gear and Clutches. 4. Design Flywheels.	1. Technical quizzes 2. Class test 3. Question & answer 4. Practical performance by students. 5. Mid Term Exam and Semester examination.
2	Fuels And Lubricants	After successful completion of this course, students will be able to 1. Understand the importance of automotive fuels 2. Understand the manufacturing methods of automotive fuels and lubricants 3. Understand the testing methods of lubricants 4. Understand the testing methods of automotive fuels 5. Understand the combustion methodology of automotive fuels and lubricants.	1. Technical quizzes 2. Class test 3. Question & answer 4. Practical performance by students. 5. Mid Term Exam and Semester examination. 6. Practical assessment is done through practical test results, practical files and Viva voce
3	Garage Equipments	After successful completion of this course, students will be able to 1. Identify the hand tools and instruments used in automotive garage. 2. Use different automotive garage measuring, marking, turning, measuring, testing and cutting tools.	1. Technical quizzes 2. Class test 3. Question & answer 4. Practical performance by students. 5. Mid Term Exam and Semester examination

4	Auto Engineering Drawing	After successful completion of this course, students will be able to 1. Enables students to learn the concepts of graphic communication. 2. familiar with different drawing equipment's, technical standards and procedures for construction of geometric figures 3. Improve their visualization skills so that they can apply these skills in developing new products. 4. Improve their technical communication skill in the form of communicative drawings.	1. Technical quizzes 2. Class test 3. Question & answer 4. Practical performance by students. 5. Mid Term Exam and Semester examination. 6. Practical assessment is done through Drawing sheets, and Viva voce.
5	Fault Diagnosis and Driving	After successful completion of this course, students will be able to 1. Gain knowledge about vehicle operation and maintenance, service schedules etc., 2. Gain skills in handling situations where the vehicle is likely to fail. 3. Understand maintenance procedures like repairing, overhauling etc., 4. Understand the concept of fault diagnosis. 5. Understand the various advances in fault diagnosis. 6. Drive 04 Wheeler (LMV)	1. Service Station Visit 2.Assignments 2. Technical quizzes 3. Seminars, 4. Practical assessment is done through practical test results, practical files and Viva voce
6	Cad in Automobile Engineering	After successful completion of this course, students will be able to: 1. Understand the fundamental concept, features and benefits of CAD. 2. Draw a 2-Dimensional sketch, views of automotive components in CAD environments. 3. Draw simple assembly drawings and prepare detailed part drawings of automotive components using CAD 4. Draw the orthographic views of an object in CAD environment 5. Dimension the views, show some annotations, provide the size tolerance of functional features, and general tolerances	1. Assignments 2. Technical quizzes 3. Seminars, 4. Practical assessment is done through practical test results, practical files and Viva voce