

ME2354 AUTOMOBILE ENGINEERING

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OBJECTIVE:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I VEHICLE STRUCTURE AND ENGINES

9

Types of automobiles , vehicle construction and different layouts ,chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms ,functions and materials

UNIT II ENGINE AUXILIARY SYSTEMS

9

Electronically controlled gasoline injection system for SI engines., Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system ,Turbo chargers, Engine emission control by three way catalytic converter system .

UNIT III TRANSMISSION SYSYTEMS

9

Clutch-types and construction ,gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel –torque converter , propeller shaft, slip joints, universal joints, Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING,BRAKES AND SUSPENSION SYSTEMS

9

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems , Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control

UNIT V ALTERNATIVE ENERGY SOURCES

9

Use of Natural Gas, Liquefied Petroleum Gas. Bio-diesel, Bio-ethanol , Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance ,Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell

Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kirpal Singh, “ Automobile Engineering Vol 1 & 2 “, Standard Publishers, Seventh Edition , 1997, New Delhi
2. Jain,K.K.,and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002

REFERENCES:

1. Newton ,Steeds and Garet,” Motor Vehicles “, Butterworth Publishers,1989
2. Joseph Heitner, “Automotive Mechanics,” Second Edition ,East-West Press ,1999
3. Martin W. Stockel and Martin T Stockle , “ Automotive Mechanics Fundamentals,” The Goodheart –Will Cox Company Inc, USA ,1978
4. Heinz Heisler , ‘Advanced Engine Technology,” SAE International Publications USA,1998
5. Ganesan V..” Internal Combustion Engines” , Third Edition, Tata Mcgraw-Hill ,2007

SUBJECT DESCRIPTION AND OBJECTIVE

CONTENTS

This subject deals with vehicle structure and engines, Engine auxiliary systems, Transmission systems, Steering, brakes and suspension, Alternative energy sources.

OBJECTIVES

To impart knowledge to students in various systems of Automobile Engineering and to have the practice for assembling and dismantling of engine parts.

MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
UNIT I - VEHICLE STRUCTURE AND ENGINES		
1	Types of Automobiles	T1
2	Types of Automobiles	
3	vehicle construction and different layouts	T1
4	vehicle construction and different layouts	T1
5	chassis, frame and body	T1
6	resistances to vehicle motion and need for a gearbox	T1
7	components of engine-their forms ,functions and materials	T1
8	components of engine-their forms, functions & materials	T1
9	components of engine-their forms, functions & materials	T1
UNIT II - ENGINE AUXILIARY SYSTEMS		
10	Electronically controlled gasoline injection system for SI engines	T1
11	Electronically controlled gasoline injection system for SI engines	T1
12	Electronically controlled diesel injection system	T1
13	Electronically controlled diesel injection system	T1
14	Electronic ignition system	T1
15	Electronic ignition system	T1
16	Turbo chargers	T1
17	Engine emission control by three way catalytic converter system	T1
18	Engine emission control by three way catalytic converter system	T1
UNIT III - TRANSMISSION SYSYSTEMS		
19	Clutch-types and construction	T1
20	Gear boxes, Manual & Automatic	T1
21	Gear boxes, Manual & Automatic	T1
22	Overdrives	T1
23	Hotchkiss & Torque tube drive	T1
24	Transfer box fluid flywheel & Torque convertors	T1
25	Differential & Rear axle	T1
26	Propeller shaft, slip joint & universal joint	T1
27	Simple floor mounted gear shift mechanism	T1

UNIT IV - STEERING,BRAKES AND SUSPENSION SYSTEMS		
28	Steering Geometry	T1
29	Types of steering gearbox	T1
30	Types of steering gearbox	T1
31	Suspension systems	T1
32	Braking systems	T1
33	Types of brakes	T1
34	ABS & Traction control	T1
35	Power steering	T1
36	Types of front axle	T1
UNIT V - ALTERNATIVE ENERGY SOURCES		
37	Natural gas	T1
38	Hydrogen gas	T1
39	LPG	T1
40	Bioethanol	T1
41	Biodiesel	T1
42	Biodiesel	T1
43	Electric & Hybrid vehicle	T1
44	Electric & Hybrid vehicle	T1
45	Fuel Cell	T1

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VI SEMESTER

MECHANICAL ENGINEERING

ME2354 – AUTOMOBILE ENGINEERING

PART A

UNIT I

1. Why unleaded petrol must be used if catalytic converter is used in a car?
2. What are the firing orders of a 4 cylinder and 6 cylinder engines.
3. Explain in brief the layout of a diesel vehicle.
4. List down the classification of I.C. engines based on the number of strokes and method of charging.
5. What is meant by air pollution? What are the pollutants emitted by an automobile?
6. What is the role played by aerodynamics in vehicle design? Write its advantages.
7. What are the purposes of the cooling system?
8. What are the purposes of the lubricating system?
9. List down the parts in the engine, need to be lubricated.
10. What are the necessities of using turbocharger in a vehicle?

UNIT II

1. What is the function of a carburetor?
2. What are the advantages of Electronic fuel injection system compared to carburetion system in S.I. engines?
3. What do you understand by monopoint and multipoint injection system?
4. What is the function of a car's generator?
5. What are the disadvantages of contact breaker in the ignition system?
6. What are the advantages of magneto coil ignition system over Battery ignition system?

UNIT III

1. What is the function of Synchromesh unit in a gearbox?
2. What are the functions of Universal joint and Slip joint in a propeller shaft?
3. What are semi-floating and full floating rear axles?
4. Mention the function of a clutch. List down any two types of clutches.
5. What are the advantages of overdrives?
6. What do you mean by fluid coupling?
7. What is the use of torque converter?
8. Define slip in the clutch. Write down the causes for it.
9. What is the need for a differential mechanism in an automobile?
10. What is meant by differential lock?

UNIT IV

1. Write down any two advantages of hydraulic brake over mechanical brake system.
2. Distinguish between disk brake with drum brake.
3. Explain different types of brakes available.

4. What is meant by bleeding of brakes?
5. Write short notes on Anti-lock Braking System.
6. What do you mean by Toe-in and Toe-out.
7. How are the wheels and tyres designated?
8. How alignment may be corrected in automobile wheels?
9. Give a brief note on damper.
10. What is steering gear ratio?

UNIT V

1. Mention the limitations of using hydrogen as automobile fuel.
2. What are the major advantages of using hydrogen as fuel in automobiles?
3. What do you understand by gasohol and diesohol? Indicate the methods to prepare the same.
4. What is meant by parallel hybrid configuration?
5. What is hybrid electric vehicle?
6. On what principles are fuel cells working?
7. Explain the application of fuel cell.
8. Compare LPG and CNG cars working principles.
9. Give any advantages of biodiesel.
10. Briefly discuss about the emission from gasohol based vehicles.

PART B

UNIT I

1. Describe the working of different types of cooling system with neat sketches. (16)
2. Describe the working of different types of lubricating system with neat sketches. (16)
3. Explain the working of a 3-way Catalytic Controller with a neat sketch. (16)
4. Explain the working of Electronic Engine Management System with a neat sketch. Write down its advantages. (16)
5. (i) Describe the working of the turbocharger with a neat sketch. (8)
(ii) Draw the layout of the chassis and explain the construction. (8)
6. Explain the different types of frames with neat sketches. (16)
7. Explain briefly the construction of a four stroke cycle C.I. Engine with a neat sketch. (16)

UNIT II

1. Explain the construction and working of the Lead acid battery. (16)

2. Explain the working of the Electronic fuel injection system with a neat sketch. (16)
3. Explain the working of the Solex Carburetor with a neat sketch. (16)
4. Explain the working of the Battery and magneto coil ignition system. (16)
5. Explain the different types of starting motor drives. (16)
6. (i) With the help of a neat sketch explain about the electronic ignition system. (8)
(ii) Explain in detail the Automobile Electrical system with a neat sketch. (8)
7. With the help of a neat sketch explain about the Lighting system. (8)

UNIT III

1. Discuss the working principles of (a) Torque tube drive, (b) Hotchkiss drive. (16)
2. Explain the construction and working principles of a typical automobile synchromesh gearbox. (16)
3. Explain the construction and working of the different types of live rear axles. (16)
4. (i) What is clutch? Explain the operation of centrifugal clutch. (8)
(ii) Explain the Differential operation with a neat sketch. (8)
5. (i) With neat sketch explain the working principle of fluid flywheel. (8)
(ii) With neat sketch explain the working principle of Torque converter. (8)
6. Give short notes on the following with neat sketches (i) Propeller shaft (5)
(ii) Slip joint. (5)
(iii) Universal joint. (6)
7. (i) Explain the operation of a single plate clutch with a neat sketch. (8)

UNIT IV

1. With a neat sketch explain the principle of operation of a hydraulic braking system. (16)
2. Sketch and explain the working of power steering system. (16)
3. Explain the construction and working of any two types of steering gear with neat sketches. (16)

4. (i) Explain the operation of a telescopic type shock absorber with a neat sketch. (12)
(ii) Differentiate between cross-ply and radial-ply tyres. (4)
5. (i) Narrate briefly about servo-braking system and mention its merits and demerits. (12)
(ii) What are the advantages of independent suspension system? (4)
6. (i) Explain the working of Disc braking system. (12)
(ii) Give short note on leaf spring suspension system (4)
7. Explain the steering geometry that is, castor, camber, toe-in, toe-out and King pin inclination with respect to wheel geometry with sketches.
8. (i) Explain the different types of wheels. Discuss their relative merits. (7)
(ii) Explain in detail about front suspension with neat sketches. (9)
9. (i) What is the working principle of antilock braking system? Explain with neat sketch. (8)
(ii) Describe with the help of simple diagram the different types of front or stub axles. (8)

UNIT V

- 1.(i) With a block diagram indicating clearly the power flow explain the operation of a hybrid vehicle. (8)
(ii) Explain the working principle of fuel cell with a neat sketch. (8)
2. (i) Explain the method of biodiesel production through transesterification process. (8)
(ii) Discuss the alternative fuel suitable for compression ignition engine driven automobiles. (8)
3. Explain the working of fuel cell and list out its advantages over other alternative fuels. (16)
4. Discuss the use of following alternative fuels in automobile engines (i) LPG (ii) Biodiesel (iii) CNG. (5+6+5)
5. With a layout diagram explain the working features of hybrid vehicles. (16)
6. Write short notes on: (i) Electric vehicles, (ii) Biodiesel concept in vehicles. (16)
7. Explain the operation of hydrogen fueled vehicle with neat sketch. (16)
8. Discuss the operation of a LPG propelled Automobile with neat sketch. (16)