GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Mechanical (I.C.Engine and Automobile Engineering)

Subject Code : ME02080021

Subject Name :Automobile Maintenance and Pollution Control

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Fundamentals of I.C. Engines & Automobile vehicle, knowledge about maintenance procedures at under graduate level.
Rationale:	The focus on automobile maintenance represents a proactive approach to mitigating pollution at an early stage within the automotive sector. The emissions produced by vehicles contribute significantly to atmospheric pollution, and the continuous rise in the number of automobiles has led to pollution levels exceeding acceptable limits. Consequently, automobile emissions have emerged as a pressing socioeconomic issue. It is essential for postgraduate students to possess a comprehensive understanding of automobile maintenance and pollution control. This course aims to impart knowledge regarding maintenance practices, the causes of automobile emissions, and strategies for their reduction.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Utilize tools and modern equipment to assess vehicle performance and resolve issues	U
2	Demonstrate knowledge of workshop management, safety practices and record keeping	A
3	Apply logical and systematic approaches to troubleshooting and resolving mechanical issues, demonstrating critical thinking in maintenance procedures for various automotive systems.	A
4	Demonstrate knowledge of emission testing procedures, diagnostic tools, and techniques used to monitor and measure automotive emissions	A

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Engine Maintenance:** Engine troubles, effects & remedies, Different major & minor services for engine, inspection and checking of components visually and dimensionally, reconditioning methods of engine components, engine tune-up, special tools & advanced equipment.	8	19
2.	**Chassis Dive-line Maintenance:** Maintenance, repair and servicing of clutches, Fluid flywheel, gear boxes, Automatic transmission, CVT unit, propeller shaft, differential unit, front axle and rear axle, suspension systems, servicing of brake systems- hydraulic, air systems, brake bleeding and brakes adjustments, maintenance and servicing of steering system-Manual & Power Steering system, wheel balancing, wheel alignment, maintenance of tyres, tyre rotation, frame defects, chassis frame alignment.	9	22
3.	**Maintenance, servicing of auxiliaries:** Cooling system service, anti-corrosion additives, anti-freezing solutions, dry & wet liners, Petrol fuel and diesel fuel system maintenance, MPFI maintenance, lubrication system services, Chassis lubrication, lubrication chart, maintenance and care of storage batteries, battery testing methods, maintenance of ignition systems, tyre service & reconditioning.	8	19
4.	**Air Pollution due to Automobile Exhaust :** Sources of Emission, Exhaust gas constituents & analysis, Ingredients responsible for air pollution, Smoke , odor, Smog formation, Sources of pollution, effects, Analysis of air pollutants, Air pollution control models and equipment.	10	19
5	**Exhaust Emission Control:** Basic method of emission control, catalytic converter, After burners, reactor manifold, air injection, crankcase emission control, evaporative loss control, Exhaust gas recirculation, Fuel additives. Pollution Norms : European pollution norms, Indian pollution norms as per Central Motor Vehicle Rules(C.M.V.R.).Characteristics of solid waste, Potential methods of solid waste disposal, Energy recovery from municipal and Industrial solidwaste.	10	21
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**30**	**60**	**--**	**--**	**--**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Mechanics of Road Vehicles – W. Steed, Illefe Books Ltd. London
2. Automotive Chassis – P. M. Heldt, Chilton Co. NK
3. Automobile Maintenance and Garage Practice - Dhruv U. Panchal, Jayesh P. Maniar, And Jigar A. Doshi, PHI Learning, Delhi
4. I. C. Engine – Litchy
5. I. C. Engine – Obert
6. Introduction to Internal Combustion Engines", Richard Stone, McMillan, London
7. Vehicle and Engine Technology – Hein Heister
8. Advance Vehicle Technology - Hein Heister
9. S. I. Engine – Fuel Injection Development - Charles A. Fisher, Chapman & Hall
10. Automotive Engines - Herbert E. Ellinger
11. Automobile Engg. Volume – I - American Technical Society, Chicago
12. Internal Combustion Engines Fundamentals – John B. Heyhood, McGraw Hill
13. Environmental Engineering, H.S.Peavy, D.R.Rowe, G.Tchobanoglous, McGrawHill Book Company, New York.
14. Introduction to Environmental Engineering and Science, G. Masters, Prentice-Hall International Editions.
15. Environmental Considerations in Energy Development, Asian Development Bank(ADB) Manila.

Suggested Course Practical List: If any

1. Study of Garage layouts, Workshop management and automotive service equipment.
2. Cleaning and Testing of a Petrol Injector on MPFI test bench.
3. Overhauling of Carburetor and Gearbox.
4. Study working principle and perform operation of (a) Four post hoist (b)Electronic air inflator (c)Tyre changer (d) Car Washer.

5. Inspection and service of an Air conditioning system of a car using AC recovery unit and UV leak detector.
6. Performance & emission test on Heavy duty diesel engine (transient Dyno)
7. Study of Emission test for SI Engine (i) 2 wheelers (ii) 3 wheelers (iii) 4 wheelers on Chassis
8. Dynamometer.
9. Performance & emission test on CNG engines.
10. To study Noise reduction in muffler.

List of Laboratory/Learning Resources Required:

- Necessary instruments, kits and apparatus are to be provided for conducting above said practical in a group of maximum four students.

Open Ended Problems:

- Necessary steps for Service procedure and Maintenance schedule chart for service of any car from any reputed service stations.

Review Presentation (RP):

- The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.

Suggested Activities for Students: Engaging students in practical activities is crucial for enhancing their understanding and skills in the field of maintenance of vehicles. Here are suggested activities that can complement the theoretical learning and laboratory experiments:

1. Field Trips and Industry Visits:
2. Guest Lectures and Expert Talks:
3. Technical Workshops and Hands-on Training:
4. Maintenance Challenges:
5. Case Studies and Problem-Based Learning:
6. Internships and Industry Projects:

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