Course	MEC510 Automobile Engineering	Semester	Monsoon Semester 2024
Faculty Name(s)	Akhand Rai	Contact	akhand.rai@ahduni.edu.in
School	SEAS	Credits	3
GER Category:	Not Applicable	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP

Schedule

Section 1	11:00 am to 12:30 pm	Tue	01-08-24 to 26-11-24
	11:00 am to 12:30 pm	Thu	01-08-24 to 26-11-24

Prerequisite	MEC000 Kinematics and Structure of Machines/MEC200 Kinematics and Structure of Machines
Antirequisite	Not Applicable
Corequisite	Not Applicable

Course Description	The course will cover the various components of an automobile system such as engine, transmission system, braking system, suspension system, axle and steering system. The competency of analyzing the performance of vehicle is developed through this course. The students will be exposed to different aspects of an automobile such as wheel alignment and balancing, and exhaust emissions control techniques. Finally, it provides an overview of the influential automobile technologies such as electric vehicles and hybrid vehicles, etc. **Unit-1 Introduction to Automobile Engineering** Overview of automobiles **Unit-2 IC Engines** Introduction to Engines, Four-stroke engines, Two-stroke engines, Turbocharger, Supercharger **Unit-3 Transmission and Ignition System** Clutch, Gear box, Propeller shaft, Differentials, Axles **Unit-4 Cooling and Lubrication System** Introduction, Methods of cooling, Air cooling system, Water cooling system **Unit 5: Chassis and Suspension System** Introduction and Functions, Classification of chassis, Suspension Systems **Unit 6: Braking and Steering System** Introduction, Classification of brakes, Drum brake, Disc brake, Air brake, Power brake, ABS technology **Unit 7: Fuel Supply System** Introduction, Types of injection, Throttle Body Fuel Injection, Multi-Port Injection, Sequential Injection, Direct Injection **Unit 8: Exhaust Emissions Control in Automobiles** Introduction, Catalytic Converter, Exhaust gas recirculation (EGR) **Unit 9: Recent Developments in Modern Vehicles** Introduction, Electric vehicles

Course Objectives	1) To make the student conversant with fundamentals of various automobile systems like clutch, brake, suspension, steering, transmission, etc. 2) To develop competencies in performance analysis of vehicles. 3) To make aware of sources, mechanism and control of Exhaust emissions from the Automobile. 4) To make the student conversant with instrumentations, computers in the Automobile. 5) To get exposure about the emerging trends of recent development in Automobiles like electric vehicles, hybrid electric vehicles, solar vehicles, etc.
Learning Outcomes	On completion of this course, students will be able - 1) To compare and select the proper automotive system for the vehicle. 2) To understand the construction details and working of various systems such as transmission, braking, suspension, steering system, etc. 3) To analyse the performance of the vehicle. 4) To apply the knowledge of EVs, hybrid vehicles, solar vehicles, etc. in the current scenario of Automobile
Pedagogy	Every session will consist of at least one or more of the following (1) Lecture (2) Videos (3) Demonstrations (4) Problem solving and discussions (5) Industry visit (depending upon COVID-19 situation) (6) Presentations / Project
Expectation From Students	1) Students are encouraged to be present and actively participate in all class sessions. 2) Timely submission of assignments and practising problems is essential.

Assessment/Evaluation	• Mid-Semester Examination:
	  ◦ Written - 40%
	• End Semester Examination:
	  ◦ Written - 40%
	• Other Components:
	  ◦ Assignment - 10%
	  ◦ Quiz - 10%

Attendance Policy	As per Ahmedabad University Policy. As per University Policy
Project / Assignment Details	There are three (03) assignments. These assignments will contain problems related to real life scenarios, designed to enhance the knowledge of students in a comprehensive way
Course Material	Text Book(s) • Automotive Mechanics, William Crouse and Donald Anglin, 10 Edition, Tata McGraw Hill, Year: 2017, • Automobile Engineering, Vol. I and II, Kirpal Singh, Standard publisher Distributors, Delhi., • Automotive Mechanics, William Crouse and Donald Anglin, 10 Edition, Tata McGraw Hill, Year: 2017, Reference Book • Automobile Engineering, K.K.Jain & R.B. Asthana, McGraw-Hill, Year: 2002, • Modern Electric, Hybrid Electric, Fuel Cell Vehicles, Ehsani, Yimin Gao, Ali Emadi, 3 Edition, CRC press, Year: 2019,
Additional Information	

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introduction	Introduction to Course, Concept of Automobile, Automobile layout	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
2	Introduction	Parts of an Automobile and their functions	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
3	Introduction	Chassis layout and frames, Automobile Industry in India.	Lecture notes/ Demonstration/ Videos	Lecturing, Problem solving, Discussion	
4	Engines in Automobiles	Engine and its components, Fuel systems for petrol and diesel engines, , Engine fuels,	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion,	
5	Engines in Automobiles	Four Stroke petrol and diesel engines, Multicylinder engines,	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
6	Engines in Automobiles	Cooling and lubrication systems	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
7	Engines in Automobiles	Performance analysis of IC engines	Lecture notes/ Demonstration/ Videos	Lecturing, Problem solving, Discussion	
8	Transmission System: Clutches	Functions and requirements of clutch, Construction, working and design of single plate and multiplate clutch	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion, Problem Solving	
9	Transmission System: Clutches	Other type of clutches such as Centrifugal clutch, electromagnetic clutch etc.	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion,	
10	Transmission System:	Functions and need of gear box, Types of transmission gear boxes like Sliding mesh, Constant mesh, Synchromesh and Epicyclic/Planetary gear box	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	

11	Transmission System:	Fluid coupling and Torque Converter.	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
12	Propeller shaft, differential and axle	Final drive, Propeller shaft, Universal coupling,	Lecture notes/ Demonstration/ Videos	Lecturing, Problem Solving, Discussion	
13	Propeller shaft, differential and axle	Rear axles, Differential	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion, (Quiz 1)	
14	Mid-Semester Examination	Mid-Semester Examination	Mid-Semester Examination	Mid-Semester Examination	
15	Brakes and Suspension System: Braking system	Principle of braking, Construction and working of Drum and Disc type brakes,	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
16	Brakes and Suspension System: Braking system:	Hydraulic brakes, Pneumatic brakes, Vacuum brakes, Power brakes, Parking brake, Anti-lock braking system (ABS).	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
17	Brakes and Suspension System: Braking system:	Calculation of braking force, torque and efficiency	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion, Problem Solving	
18	Brakes and Suspension System: Suspension system:	Objectives of Suspension System, Terminologies, Types of suspension springs-like leaf, coil and torsion bar,	Lecture notes/ Demonstration/ Videos	Lecturing, Problem Solving, Discussion	
19	Brakes and Suspension System: Suspension system:	Shock absorbers, Telescopic shock absorber,	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
20	Brakes and Suspension System: Suspension system	Front wheel independent suspension (IFS), Rear wheel independent suspension (IRS), Spring deflection and calculations	Lecture notes/ Demonstration/ Videos	Lecturing, Problem solving, Discussion	

21	Front Axles and Steering System:Axles &Steering system	Front axle system and construction, Principle of correct steering, layout of steering system, Ackermann's steering mechanism	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
22	Front Axles and Steering System: Axles & Steering system	Types of steering systems, Rack and pinion type gear arrangement, Steering geometry, Oversteer and Understeer.	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
23	Vehicle Performance Characteristics	Vehicle performance parameters, Aerodynamic resistances, Tractive resistances, Power requirement for propulsion.	Lecture notes/ Demonstration/ Videos	Lecturing, Problem solving, Discussion	
24	Wheel and Tyres	Functions, Wheel types, Tyres types, Wheel alignment and balancing.	Lecture notes/ Demonstration/ Videos	Lecturing, Problem solving, Discussion	
25	Automobile Air conditioning	Basic working principle, Layout of Equipments, Specifications, Refrigerants used in automobile air conditioning	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
26	Exhaust Emissions, Control in Automobiles	Major Pollutants from Automobiles and its sources, Exhaust emissions control techniques such as Injection timing control	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
27	Exhaust Emissions Control in Automobiles	Exhaust Gas Recirculation (EGR), Catalytic Converter	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion, (Quiz 2)	
28	Recent Development in Modern Vehicles	Electric vehicles, Solar car and hybrid vehicles, Latest trends	Lecture notes/ Demonstration/ Videos	Lecturing, Discussion	
29	Recent Development in Modern Vehicles	Electric vehicles, hybrid vehicles, latest trends	Lecture notes/videos/animations	Lecturing, discussion	
30	Reflections and Reviews	Reflections and Reviews	Reflections and Reviews	Reflections and Reviews	

31	Reflections and Reviews	Reflections and Reviews	Reflections and Reviews	Reflections and Reviews	
32	End Semester Examination	End Semester Examination	End Semester Examination	End Semester Examination	