

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	OMED623	Fundamentals of Automotive Systems	3	0	0	3

Prerequisites
Bachelor/Master/PhD students having background in Mechanical Engineering/Production Engineering/Manufacturing Technology; Knowledge about Rigid Body Dynamics, Thermodynamics, Fluid Mechanics;
Course Objective
The objective of this course is to provide a fundamental understanding of the various systems of a typical automobile. The key objective of this course is to learn the below mentioned automotive systems: 1. Internal Combustion Engines, Engine components and operation of engines; 2. Engine Performance, Supercharging, Combustion in Spark Ignition Engines Air Brake, Antilock Brake System; 3. Engine Emissions & Emission Control Systems; 4. Automotive Clutch Parts; Automotive Powertrain systems; 5. Advanced Powertrain analysis; 6. Braking Analysis & Steering system; 7. Introduction to electric and hybrid powertrain;
Learning Outcomes
At the end of this course, the participant should be able to: 1. Acquire fundamental knowledge of the various systems of an automobile, 2. Associate the functions of each system with its design and layout, 3. Depict the various systems using simple schematics, and 4. Apply concepts learnt in core courses to synthesize mathematical models of the various systems.

Unit No.	Topics to be covered	No. of Lecture Videos	Video Time (Minutes)	Learning out come
1.	Course Overview, Classification of Internal Combustion Engines, Engine Components, Operation of Four Stroke Engines.	6	145	Building foundation for basic automotive systems and its operations.
2.	Two Stroke Engine and Engine Cycles, Otto Cycle & Diesel Cycle, Dual Cycle and Engine Performance – Assignment and discussion.	6	141	This unit will help the students to understand the two stroke engine cycles.
3.	Engine Performance, Supercharging and Combustion in SI Engines, Knocking in SI Engines, Assignment and discussion.	6	133	Understanding about engine performance curves, supercharging and combustion in SI engines.
4.	Combustion in CI Engines & Carburetion, Fuel Introduction systems, Analysis of Carburetor, Assignment and discussion.	6	149	Understanding about CI engines & carburetion with detailed explanations.
5	Engine Emissions; Emission Control Systems;	6	139	Understanding about engine emissions and emission control systems; Also,

	Automotive Powertrain systems; Assignment and discussion.			explanation about automotive powertrain systems.
6	Automotive Clutch Parts; Transmission Parts; Powertrain Analysis; Assignment & discussion.	6	144	Know about automotive clutch parts, transmission components and powertrain analysis
7	Advanced Powertrain analysis; Transmission Matching; Brake Systems; Assignment & discussion.	6	141	Understanding about transmission matching and basic of brake system and its functions.
8	Components of a brake system and drum brake; Disc Brake and Introduction to hydraulic brake system; Assignment & discussion.	6	150	Understanding of drum brake, disc brake function; Also learn about hydraulic brake systems.
9	Air brake system; Antilock brake system; Assignment & discussion.	6	150	Learn about air brake system, Antilock brake system and its usages.
10.	Braking Analysis and problem solving; Steering system and problem solving.	6	143	Learn about braking analysis and understanding about steering systems.
11.	Power steering and kinematic steering analysis; Wheel Alignment; Introduction to suspension system; Assignment & discussion;	6	149	Learn about power steering & kinematics of steering analysis; Understanding about suspension systems.
12.	Shock Absorbers & Independent Suspension; Dependent Suspension and suspension analysis; Introduction to electric and hybrid powertrain; Tyrese - Assignment & discussion.	6	164	Understanding about shock absorbers and independent suspension; Learn about basic electric and hybrid powertrain.
Total no. of video lectures & Video Time		72	1748	

Text Books:

1. D. Crolla, D.E. Foster, T. Kobayashi and N. Vaughan (Editors-in-Chief), Encyclopedia of Automotive Engineering, Parts 1-6, Wiley, 2015.
2. R. Stone and J.K. Ball, Automotive Engineering Fundamentals, SAE International, 2004.
3. T.K. Garrett, K. Newton, and W. Steeds, The Motor Vehicle, 13th Edition, SAE International, 2001.

Reference Books:

1. D.B. Astow, G. Howard and J.P. Whitehead, Car Suspension and Handling, 4th Edition, SAE International, 2004.
2. R. Limpert, Brake Design and Safety, SAE International, 1992.
3. V. Ganesan, Internal Combustion Engines, 3rd Edition, Tata McGraw Hill, 2007.
4. M. Ehsani, Y. Gao and A. Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, 2nd Edition, CRC Press, 2010.