GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3721103
MODERN VEHICLE DESIGN
SEMESTER: II

Type of course: Program Elective - III

Prerequisite: - Mechanics of deformable bodies, Design of machine elements and basics of computer programming language.

Rationale: Automotive Engineering is the application of engineering principles to the design and analysis of the automobile in order to satisfy a performance specification. There is no doubt that an increasing automotive market in the world. This will create demand on developing technologies including vehicle design, computer-aided technology, hybrid-powered technology, environmental friendly technology, use of advanced and light materials, and transportation technology for vehicle design to support the growth of the automotive engineering in the world. In view of such, aims at providing students advanced knowledge and state-of-the-art technology for preparing them to work in the automotive engineering and design industry, particularly for modern and tomorrow's vehicle engineering design.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Unit-I** Engine Components; Material, construction and design aspects of engine components; Determination of engine power; Engine selection- swept volume, stroke, bore & no. of cylinders; Arrangement of cylinders stroke to bore ratio.	8	**19**
2	**Unit-II** Design procedure and considerations, material selection & actual design of components; cylinder block deign; Design of Piston; piston assembly; Cylinder, Cylinder liner, Cylinder head, Combustion Chamber, Connecting rod, Crank Shaft, Fly Wheel, valves, valve actuating mechanism, cams, camshaft drives, vibration damper, Gearbox design, Constant-mesh gearboxes, synchro-mesh gearboxes, heavy vehicle gearboxes.	10	**24**
3	**Unit-III** Design of couplings; design of fluid couplings; torque converter; differential axle; Suspension system design; Tandem axle suspension; adaptive suspension system; shock dampers; Steering system design – power assisted steering, four wheel steering system.	8	**19**
4	**Unit-IV** Design of Brakes – Hydraulic brakes, air and endurance brake, antilock brakes; vehicle structure; chassis frames; Principle of vehicle Aerodynamics; Aerodynamic design of vehicle, latest developments.	8	**19**

5	**Unit-V**Introduction to CAD; The product cycle and CAD; Automation and CAD; Finite element analysis; Stress analysis on Automobile Components.	8	**19**

Reference Books:

1. The Automotive Chassis – Engineering Principle – ReimpellJ.
2. Automotive Chassis – Design & Calculation – P. Lukin, G. Gasparyarts,V. Rodionov, MIRPublishing,Moskow
3. Automotive Chassis – P. M. Heldt, Chilton Co.NK
4. Mechanics for Road Vehicles – W. Steed, Illiffe Books Ltd.,London
5. Design of Automotive engines, Kolchin andDemodov
6. Automotive design, Jiles.J.G
7. Machine Design, Pandya andShah
8. Machine Design, Khurmi and Gupta

Course Learning Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Calculation of Basic design aspects of different engine components	15
CO-2	Selection , evaluation , force analysis of different engine parts	25
CO-3	Force analysis, and Design of suspension system components	19
CO-4	Evaluation and calculation of I.C. engineBrakes and its recent developments.	21
CO-5	Knowledge of CAD Automation, Finite element analysis of Automobile Components.	20

List of Experiments:

1. To study engine components, materials and design aspects of its.
2. To study detailed design of couplings, steering and shock absorber.
3. To study and prepare report on the constructional details, working principles and operation of the Automotive Brake systems
4. To study and practice software for design of various components.