GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (I.C. ENGINE & AUTOMOBILE ENGINEERING) (11)

MODERN VEHICLE DESIGN

SUBJECT CODE: 2721103

SEMESTER: II

Type of course: Advanced/ Application

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
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	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 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 – Reimpell J.
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 and Demodov
6. Automotive design, Jiles. J.G
7. Machine Design, Pandya and Shah
8. Machine Design, Khurmi and Gupta

Course Learning Outcome:

After successful completion of the course, student will be able to:

- Understand various components of engine its material and design aspect.
- Understand design procedure
- Understand design of coupling, steering and shock absorber.
- Understand design of brakes
- Familiar with software for design various component.

List of Experiments:

Open Ended Problems:

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.