GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering
Level: PG
Branch: Electric Vehicle Technology
Course / Subject Code: ME01000211
Subject Name : Automotive Chassis & Body Engineering

WEF Academic Year :	2024 – 25
Semester :	1st Semester
Category of the Course :	PEC

Prerequisite :	Nil
Rationale :	The course is design to provide comprehensive and logical knowledge of chassis and body components and their design parameters and safety and ergonomic aspects.

Course Scheme :

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

Course Content :

Sr. No.	Content	Total Hrs
1	**Chassis layout and body structure :** Introduction of automobile chassis and body components, Vehicle dimensions, Weight and axle loads, Traction behavior, Platform, nit assembly and common part systems, Chassis layouts based on drive systems, Body architecture for passenger cars, bus and commercial vehicles, Vehicle structure types :underfloor chassis frame, backbone structure, triangulated tube structure, monocoque, integral or unitary body structure, Load path in body, Structural analysis by simple structural surface model, Materials for consideration and use in automotive body structures.	**10**

2	**Suspension, Steering and Braking systems:** General characteristics of suspensions, Springs and shock absorbers types, Rigid and semi rigid axle suspension system and their types, independent suspensions system requirements and types. Active suspension systems, requirement and characteristics, types. Steering system requirements, Steering system for independent suspension and rigid axle suspension, Steering gears, Power steering systems(hydraulic, electro-hydraulic, electric) ,Ackermann steering geometry, Steer angle and steering ratio, Under steer, Over steer and Neutral steer, Steering geometry angles. Conditions of use of braking system, Braking system components and configurations, Kinematic and kinetic analysis of braking vehicle, Brake proportioning, Power brakes.	**10**
3	**Wheels and Tyre :** Wheel rims for passenger car and commercial vehicles, Wheel sizing, Wheel types and mountings. Tyre requirements for passenger car and commercial vehicles, Interchangeability, Tyre design (diagonal ply, radial ply) and construction, Tyre dimensions and markings, Forces generations due to tyre, Tyre properties.	**05**
4	**Automobile body aerodynamics:** Automobile body axis, aerodynamic forces and motions, Viscous air flow parameters, Aerodynamic drag and lift, Drag and lift coefficients w.r.t body shapes, Drag and lift control aids for passenger and commercial vehicle bodies.	**04**
5	**Safety and security systems:** Active safety systems and passive safety systems, Airbags, Seat belt tightening system, Collision warning systems, Child Lock, Vision enhancement, Road recognition system, Anti-lock braking systems, Traction control systems, electronic stability programme, Safety regulations and crash testing, Antitheft technologies, Smart card system, Number plate coding, Central locking system.	**08**
6	**Ergonomics:** Introduction to automobile ergonomics, Anatomy of passenger car package, Process to setup basic exterior hard points, Driver and Occupant's manikin characteristics and their use in body design, Anatomy of driver manikin, Occupant packaging for body design, Driver and occupant height and positions, Introduction of interiors, Instrument panel and consoles consideration for driver vision, safety and reach, Seat construction and packaging, Field of view and types, Designing for cargo, Body closure.	**08**
	TOTAL	**45**

Suggested Specification table with Marks (Theory) :

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**30**	**30**	**30**	**00**	**00**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note : This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Book :

1. Dr. N. K. Giri, "Automobile Mechanics", Seventh reprint, Khanna Publishers, Delhi
2. Robert Bosch, "Automotive Hand book", SAE
3. Prof. Dipl.-Ing. Jörnsen Reimpell et.al, "The Automotive Chassis, Engineering Principles", Butterworth- Heinemann, Reed Elsevier and Professional Publishing Ltd.
4. David A. Crolla, "Automotive Engineering: Powertrain, Chassis System and Vehicle Body", Elsevier.
5. Heinz Heisler, "Advanced Vehicle Technology", second edition, Elsevier science
6. David A. Crolla et.al, "Encyclopedia of Automotive Engineering", Wiley.
7. V D Bhinse, "Ergonomics in Automotive Design", CRC Press.
8. Jnusz Pawlowski, "Vehicle Body Engineering", Business books limited.
9. Stuart Macey et.al, "H-Point: Fundamental of car designing and packaging", Design studio press

Course Outcome : After Completion of the Course, Student will able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand basic knowledge about functional and operational aspects of body and chassis.	25%
CO-2	Identify and use of the design parameters for selection of chassis and body structure.	20%
CO-3	Evaluate types of automobile systems for proper functioning and performance of an automobile.	15%
CO-4	Comprehend the safety and structural integrity related to vehicle body.	20%
CO-5	Evaluate ergonomic consideration and interaction between humans and vehicle systems.	20%

List of Experiments :

1. To study types and components of vehicle chassis and body.
2. To study body architecture for passenger cars, bus and commercial vehicles.

3. Discuss case study on Structural analysis by simple structural surface model of any sedan or saloon vehicle.
4. To study different types of vehicle suspension system and their kinematic arrangements.
5. To study types and components of steering and braking systems.
6. To study tyre construction, design, sizing and properties.
7. Discuss case study on aerodynamic drag reduction technique of any vehicle.
8. Study about active and passive safety systems.
9. To assess the usability, comfort and visibility of various vehicle interior components.
10. To measure anthropometric measurements and study their interaction with vehicle interior.

Activity to be carried out : Visit of any automobile industry

Major Equipment :
1. Passenger car
2. Bus or any commercial vehicle
3. Cut section or working model of vehicle chassis.
4. Cut section of any vehicle body structure.

List of Open Source Software/learning website : http://nptel.ac.in

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