GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Mechanical (I.C.Engine & Automobile Engineering)

Course / Subject Code : ME01000461

Course / Subject Name : Automotive Chassis & Body Engineering

w. e. f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Nil
Rationale:	The knowledge and skills of vehicle body technology are crucial for managing vehicle body fabrication and repair. Chassis and body form the core of automobile engineering. This course aims to impart knowledge and skills related to chassis and body structure, including improving driver visibility and safety aspects in design. It is designed to provide students with the necessary level of expertise in automotive chassis and body engineering.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level	Marks % weightage
1	Understand, analyze, and evaluate vehicle aerodynamics.	Understand, Analyze	20
2	Acquire knowledge of various optimization techniques for minimizing drag and flow visualization.	Understand, Apply	18
3	Understand car body details, accessories, and safety considerations.	Understand, Analyze	22
4	Understand vehicular design and preliminary design with safety considerations.	Understand, Apply	18
5	Perform force analysis, design of chassis, and vehicular testing .	Apply, Evaluate	22

Teaching and Examination Scheme:

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

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Unit-I: Vehicle Aerodynamics** Vehicle drag and types, Various types of forces and moments, Effects of forces and moments, Body optimization techniques for minimum drag, Principle of wind tunnel technology, Flow visualization techniques, Tests with scale models	13	29
2.	**Unit-II: Car Body Details** Types of car bodies and their details, Visibility and regulations, Methods of improving visibility, Safety design considerations, Constructional details of roof, under floor, bonnet, boot, wings, etc., Classification of coach work	15	33
3.	**Unit-III: Design of Vehicle Bodies** Vehicle body materials and layout design, Preliminary design and safety considerations, Idealized structure and structural surfaces, Shear panel method and load distribution on vehicle structure, Stress analysis of bus body structure under bending and torsion, Design of chassis frame and rules/regulations for body design, Recent safety measures and body testing	17	38
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
	39	**29**	**21**	**11**	

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Vehicle Body Engineering – Pawloski J., Business Books Ltd.
2. The Automotive Chassis: Engineering Principles – Reimpell J.
3. Vehicle Body Layout and Analysis – John Fenton, Mechanical Engineering Publications Ltd.
4. Body Construction and Design – Giles J. G., Illife Books, Butterworth and Co

(b) Open-source software and website:

Open-Source Software

1. FreeCAD ,Website: FreeCAD
2. Blender : Website: Blender
3. OpenFOAM : Website: OpenFOAM
4. Salome : Website: Salome
5. GMSH : Website: GMSH
6. Websites for Learning and Resources : Coursera, edX, MIT OpenCourseWare, NPTEL (National Programme on Technology Enhanced Learning), YouTube Channel, SAE International, Wolfram Alpha, ResearchGate

Suggested Course Practical List:

1. To measure and analyze chassis dimensions.
2. To study different methods and procedures for testing vehicle bodies.
3. To study various optimization techniques for reducing drag through flow visualization.
4. To study various types of car bodies and methods to improve visibility and compliance with regulations.
5. To study design aspects of roof, under floor and bonnet.
6. To study different devices and techniques used to reduce aerodynamic drag in modern cars.
7. To study different types of load conditions in vehicles.
8. To study various safety systems used in modern car.

List of Laboratory/Learning Resources Required:

1. Vehicle Chassis Measurement Tools
2. Vehicle Body Testing Equipment
3. Aerodynamics Testing Facilities
4. Optimization Techniques Tools
5. Design and Analysis Software
6. Car Body Design and Safety Equipment
7. Load Conditions and Force Analysis Tools
8. Safety Equipment

Educational Resources

- Reference Books: As listed in the syllabus, including textbooks and industry manuals.
- Online Resources: Access to journals, research papers, and online databases related to automotive engineering.
- Interactive Learning Tools: Simulations and virtual labs for understanding complex concepts.

Demonstration and Training Materials

- Models and Prototypes: Physical models of vehicle components and chassis for hands-on learning.
- Training Videos: Instructional videos and tutorials related to chassis and body engineering techniques.

Suggested Project List:

1. Aerodynamic Optimization of a Vehicle
2. Design and Analysis of a Chassis Frame
3. Development of a Vehicle Safety System
4. Evaluation of Car Body Materials
5. Investigation of Visibility Improvement Techniques
6. Vehicle Load Distribution Analysis
7. Design and Testing of Drag-Reducing Devices
8. Simulation of Crash Test Scenarios
9. Development of a Scalable Vehicle Model for Wind Tunnel Testing
10. Implementation of Advanced Materials in Vehicle Body Design
11. Enhancement of Vehicle Under floor Design
12. Study of Thermal Management in Vehicle Body Design

Suggested Activities for Students: If any

1. Industry Visits and Guest Lectures
2. Simulation and Modeling Exercises
3. Case Studies and Research Projects
4. Interactive Simulations and Virtual Labs
5. Technical Paper Reviews

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