

**III Year I Semester**

**L T P C**

**Code: 20ME5757**

**3 1 0 4**

**VEHICLE BODY STYLING AND AERODYNAMICS**

**Course Objectives:**

The Students will acquire the knowledge:

1. To interpret the Structural materials
2. To discuss the Shaping and packaging
3. To outline the systematic understanding of knowledge in Load Distribution.
4. To discuss about Noise, Vibration, Harshness
5. To outline the design criteria of Vans, trucks, and buses.

**UNIT-I Structural materials:**

Aluminium alloy sheet. Extrusion and casting, Austenitic and Ferritic stainless steels. Alloy steels. Different types of composites, FRP & Metal Matrix Composites. Structural timbers - properties designing in GRP and high strength composites different manufacturing techniques of composites. Thermo plastics, ABS and styrenes. Load bearing plastics, semi-rigid PUR foams and sandwich panel construction

**UNIT-II Shaping and packaging:**

Product design and concepts, Aesthetics and industrial design, Computer aided drafting, surface development, Ergonomics system design, dash- board instruments, advances in electronic display, CV legal dimension. CV-cab ergonomics, mechanical package layout. Aerodynamics: Basics, aerofoils, aerodynamics drag lift, pitching, yawing, and rolling moments, determination of aerodynamic coefficients (wind tunnel testing). Racing car aerodynamics. bluff body aerodynamics, local air flows.

**UNIT-III Load Distribution:**

Types of load carrying structures -closed, integral, open, flat types. Calculation of loading cases- static, asymmetric, vertical loads. Load distribution, stress analysis of structure, body shell analysis. Body Fitting and Controls: Driver's seat, window winding mechanism, Door lock mechanism, other interior mechanisms, driver's visibility' and tests for, visibility, minimum space, requirements and methods or improving space in cars. Electric wiring and electronic control systems, advanced body electronics, networking or body systems controls.

**UNIT-IV Noise, Vibration, Harshness:**

Noise and vibration basics. Body structural vibrations, chassis bearing vibration, designing against fatigue, rubber as an isolator. CV body mountings. Automatic enclosures. Sandwich panels, structure dynamics applied, surety under impact: Impact protection basics. Design for crash worthiness, occupant, and cargo restraints. Passive restraint systems, slide impact analysis, bumper system, energy absorbant foams, laws of mechanisms applied to safety.

**UNIT-V Vans, trucks, and buses:**

Types of mini coach with trailers, single and double deckers. Design criteria based on passenger capacity; goods to be transported and distance to be Covered, constructional details: weights and dimensions; conventional and integral type. Vehicle stability: Steering geometry vehicle and a

curvilinear path, and lateral stability. Effects of tyre factors. Mass distribution and engine location on stability.

**TEXT BOOKS**

1. Body Engineering - Sydney F Page
2. Vehicle body engineering - Gilcs J Pawlowski,

**REFERENCES:**

1. The Automotive Body, By Lorenzo Morello, Springer, Yes Dee Publishers Pvt. Ltd.
2. Automotive chassis - P.M. Heldt. Chilton & Co
3. Handbook on vehicle body design –SAE Publications.

**Course Outcomes:**

At the end of the course, the student will be able to:

1. Outline the appropriate Structural materials
2. Select between Shaping and packaging
3. Apply a systematic understanding of knowledge in Load Distribution.
4. Describe the issues of Noise, Vibration, Harshness
5. Integrate the knowledge of design criteria of Vans, trucks, and buses.