

1151AU109	VEHICLE DESIGN AND DATA CHARACTERISTICS	L	T	P	C
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1. Preamble

This course imparts knowledge in the designing a vehicle sub systems for the given specifications.

2. Prerequisite

1151AU214	Automotive Chassis
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3. Links to other Courses

- Engine Design and Development
- Vehicle Dynamics

4. Course Educational Objectives:

Students undergoing this course are expected to:

- Acquire skills in designing frames, suspension, clutch and transmission system for the given specifications.
- Understand the design procedures of steering, brakes and axles.
- Latest trends in this course.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Generalize the selection of vehicle specifications on the basis of various forces and resistance.	K2
CO2	Choose a suitable vehicle frames and suspension systems by calculating different type of loads and moment	K3
CO3	Select the suitable clutch and transmission systems for the given vehicle specifications	K3
CO4	Calculate the loads and moment on steering, final drive, front and rear axle systems in a vehicle	K3
CO5	Choose a suitable brake system for the given vehicle specification	K3

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	H	H		M							H	H
CO2	H	H	H	H		M							H	H
CO3	H	H	H	H		M							H	H
CO4	H	H	H	H		M							H	M
CO5	H	H	H	H		M							H	H

H- High; M-Medium; L-Low

7. Course Content

UNIT – I: INTRODUCTION

L-9

Study and Selection of Vehicle Specifications - Choice of Cycle, Fuel, Speed, Method of Cooling, Material, Design Variables and Operating Variables Affecting Performance and Emission, Benchmarking. Calculation and Plotting the Curves of Air, Rolling and Gradient Resistances, Driving Force – Engine Power, Speed, Differential Ratio, Rear Axle Ratio, Torque and Mechanical Efficiency at Different Vehicle Speeds. Vehicle Interior and Exterior Design. Ergonomics and Styling.

UNIT – II: DESIGN OF VEHICLE FRAMES, BODY AND SUSPENSION

L-9

Design of Frame Members: Longitudinal, Cross and Support Members for Heavy and Light Vehicles. Load, Moment and Stress Calculations. Design of Vehicle Body. Design of Springs: Leaf, Coil and Torsion Bar. Design of Hydraulic, Pneumatic and Rubber Suspension.

UNIT – III: DESIGN OF CLUTCH AND TRANSMISSION

L-9

Design of Clutch and its Components; Single Plate, Multi Plate, Cone and Centrifugal Clutch. Energy Dissipated and Torque Capacity Calculations. Design of Roller and Sprag Type Clutches. Surplus Power and Torque Calculations and Acceleration Curves. Gear Ratio Calculations. Acceleration and Gradability - Typical Problems. Design of Gearbox: Constant Mesh, Sliding Mesh and Synchromesh. Design of Automatic Transmission.

UNIT – IV: DESIGN OF STEERING, AXLES AND FINAL DRIVE

L-9

Design of Rear Axle Bearing Loads, Axle and Axle Housing: Semi Floating, Three Quarter Floating and Full Floating. Design of Loads, Moments and Stresses Across Front Axle. Design of Front Axle Bearing Loads and Axle. Design of Propeller Shaft, Differential and Final Drive. Choice of Lubrication, Bearing and Materials for Rear Axle, Front Axle and Final Drive.

UNIT – V: DESIGN OF BRAKES

L-9

Introduction, Energy Absorbed by a Brake, Heat to be Dissipated During Braking, Materials for Brake Lining, Types of Brakes, Single Block or Shoe Brake, Pivoted Block or Shoe Brake, Double Block or Shoe Brake, Internal Expanding Brake.

8. Text Books

1. R.S.Khurmi J.K. Gupta 'A Textbook of Machine Design' Eurasia Publishing House (Pvt.) Ltd, New Delhi- 2005
2. Giri.N.K- "Automobile Mechanics"- Khanna Publisher, New Delhi- 2012.

9. References

1. Heldt.P.M - "Automotive Chassis"- Chilton Co., New York- 1992.
2. Steeds. W -"Mechanics Of Road Vehicles"- Illiffe Books Ltd., London- 1990.
3. Giles.K.G - Steering, Suspension and Tires"- Wildlife Books Ltd., London – 1988.
4. Newton Steeds & Garret- "Motor Vehicle"- Wildlife Books Ltd., London – 2001