

AT8005 AUTOMOTIVE AERODYNAMICS

DETAILED SYLLABUS

OBJECTIVE:

- At the end of the course, the students will be able to apply basic principles of aerodynamics for the design of vehicle body.

UNIT I INTRODUCTION

Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics.

UNIT II AERODYNAMIC DRAG OF CARS

Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT III SHAPE OPTIMIZATION OF CARS

Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners. Case studies on modern vehicles.

UNIT IV VEHICLE HANDLING

The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles and racing cars.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS

Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods. CFD analysis.

TEXT BOOK:

1. Hucho. W.H., “Aerodynamic of Road Vehicles”, Butterworths Co., Ltd., 1997

REFERENCES:

1. A. Pope, “Wind Tunnel Testing”, 2nd Edition, John Wiley & Sons New York, 1974.
2. “Automotive Aerodynamic”, Update SP-706, Society of Automotive Engineers Inc, 1987
3. “Vehicle Aerodynamics”, SP-1145, Society of Automotive Engineers Inc , 1996.