

COURSE CODE	COURSE TITLE	L	T	P	C
1153AE105	WIND ENGINEERING	3	0	0	3

Course Category:

Programme Elective

a. Preamble :

This course deals with the Wind-structure interaction and its effects on various applications. This course also deals with the wind tunnel techniques and flow induced vibrations.

b. Prerequisite Courses:

Incompressible flow Aerodynamics

c. Related Courses:

- Industrial Aerodynamics

d. Course Educational Objectives :

- To understand the concept of bluff body aerodynamics and wind tunnel techniques.
- To familiarize with flow induced vibrations

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Discuss the atmospheric motion and classify terrains.	K2
CO2	Compute properties of atmospheric boundary layer.	K3
CO3	Examine oscillatory flow patterns and turbulent flow	K3
CO4	Analyze the wind loading characteristics.	K3
CO5	Analyze wind structure interaction	K2

f. Correlation of COs with POs :

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

H- High; M-Medium; L-Low

g. Course Content :

UNIT I THE ATMOSPHERE 6

Atmospheric Circulation – Stability of atmospheres – definitions & implications – Effects of friction – Atmospheric motion – Local winds, Building codes, Terrains different types.

UNIT II ATMOSPHERIC BOUNDARY LAYER 9

Governing Equations – Mean velocity profiles, Power law, logarithmic law wind speeds, Atmospheric turbulence profiles – Spectral density function – Length scale of turbulence, Roughness parameters simulation techniques in wind tunnels.

UNIT III BLUFF BODY AERODYNAMICS 10

Governing Equations – Boundary layers and separations – Wake and Vortex formation two dimensional – Strouhal Numbers, Reynolds numbers – Separation and Reattachments Oscillatory Flow patterns Vortex shedding flow switching – Time varying forces to wind velocity in turbulent flow – Structures in three dimensional

UNIT IV WIND LOADING 10

Introduction, Analysis of loading coefficients, local & global coefficients pressure shear stress coefficients, force and moment coefficients – Assessment methods – Quasi steady method – Peak factor method – Extreme value method

UNIV V AEROELASTIC PHENOMENA 10

Vortex shedding and lock in phenomena in turbulent flows, across wind galloping wake galloping - Torsional divergence, along wind galloping of circular cables, cross wind galloping of circular cables, Wind loads & their effects on tall structures – Launch vehicles

Total : 45 Hrs

h. Learning Resources

i. Text Books :

1. Emil Simiu & Robert H Scanlan, Wind effects on structures - fundamentals and applications to design, John Wiley & Sons Inc New York, 1996.

ii. Reference:

1. Tom Lawson Building Aerodynamics Imperial College Press London, 2001
2. N J Cook, Design Guides to wind loading of buildings structures Part I & II, Butterworths, London, 1985 3. IS: 875 (1987) Part III Wind loads, Indian Standards for Building codes.