

Course code	Course Name	L-T-P-Credits	Year of Introduction
AO365	WIND POWER ENGINEERING	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives			
<ul style="list-style-type: none"> To familiarize the non-aeronautical uses of aerodynamics 			
Syllabus			
Atmospheric Circulation - Stability of atmospheres –Governing equations of atmospheric boundary layer - Boundary layers and separations – Oscillatory Flow patterns - Vortex shedding flow switching - Structures in three dimensional -wing loading- assessment methods - Vortex shedding and lock in phenomena in turbulent flows - Wind loads & their effects on tall structures, Launch vehicles			
Expected Outcome			
<ul style="list-style-type: none"> The students will be able to apply principles of aerodynamics in analysing structures subjected to wind loads. 			
Text Books:			
<ul style="list-style-type: none"> Emil Simiu& Robert H Scanlan, Wind effects on structures - fundamentals and applications to design, John Wiley & Sons Inc New York, 1996. 			
References:			
<ol style="list-style-type: none"> N J Cook, Design Guides to wind loading of buildings structures Part I & II, Butterworths, London, 1985 Tom Lawson Building Aerodynamics Imperial College Press London, 2001 			
Course Plan			
Module	Contents	Hours	End Sem. Exam Marks
I	Atmospheric Circulation	1	15%
	Stability of atmospheres – definitions & implications	1	
	Effects of friction – Atmospheric motion	2	
	Local winds, Building codes, Terrains different types.	2	
II	Governing equations of atmospheric boundary layer– mean velocity profiles, power law	1	15%
	logarithmic law wind speeds	3	
	atmospheric turbulence profiles – spectral density function – length scale of turbulence	2	
	Roughness parameters simulation techniques in wind tunnels.	4	
FIRST INTERNAL EXAM			
	Boundary layers and separations – Wake and Vortex formation	2	15%

III	two dimensional		
	Strouhal Number, Reynolds number – Separation and Reattachments, Oscillatory Flow patterns, Vortex shedding flow switching	1	
	Time varying forces to wind velocity in turbulent flow	3	
	Structures in three dimensions	1	
IV	Introduction to wing loading,	2	15%
	Analysis and synthesis loading coefficients, local & global coefficients, pressure shear stress coefficients, force and moment coefficients	4	
SECOND INTERNAL EXAM			
V	Vortex shedding and lock in phenomena in turbulent flows, across wind galloping, wake galloping	6	20%
VI	Torsional divergence, along wind galloping of circular cables, cross wind galloping of circular cables,	3	20%
	Wind loads & their effects on tall structures	3	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100

Exam duration: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.