

Course code	Course Name	L-T-P-Credits	Year of Introduction
AO465	INDUSTRIAL AERODYNAMICS	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>To familiarize non-aeronautical uses of aerodynamics in road vehicles, buildings and problems of flow induced vibrations.</li> </ul>			
<b>Syllabus</b>			
Atmospheric circulation - Turbulence profiles -Boundary layers and separation--Power requirements and drag coefficients of automobiles - effects of cut back angle-aerodynamics of trains. - Horizontal and vertical axis machines- Betz coefficient aerodynamics of low rise and tall buildings-building codes - ventilation and architectural aerodynamics- Vortex shedding lock& effects of Reynolds number on wake formation in turbulent flows – wind galloping - oscillation of tall structures and launch vehicles -stall flutter.			
<b>Expected Outcome</b>			
<ul style="list-style-type: none"> <li>The students will be able to apply principles of aerodynamics in the design of vehicles, buildings, launch vehicles etc.</li> </ul>			
<b>Text Books:</b>			
1. Blevins R.D “Flow Induced Vibrations”, Van Nostrand, 1990 2. Calvert N.G “Wind Power Principles”, Charles Griffin & Co London, 1979 3. Sachs P “Wind Forces in Engineering”, Pergamon Press, 1988 4. Scorer R.S “Environmental Aerodynamics”, Ellis Harwood Ltd, England, 1978 5. Sovran, M(ed) “Aerodynamic drag mechanism of bluff bodies and road vehicles”, Plenum Press, N.Y, 1978			
<b>Course Plan</b>			
Module	Contents	Hours	End Sem. Exam Marks
<b>I</b>	Atmospheric circulation	1	15%
	Local winds-Terrain types	2	
	Mean velocity profiles	2	
	Power law and logarithm law- wind speeds	2	
<b>II</b>	Turbulence profiles	2	15%
	Roughness parameters	3	
	simulation techniques in wind tunnels	3	
<b>FIRST INTERNAL EXAM</b>			
<b>III</b>	Boundary layers and separation-Two-dimensional wake and vortex formation-	2	15%

	Strouhal and Reynolds numbers-Separation and reattachment	2	
	Power requirements and drag coefficients of automobiles	3	
	Effects of cut back angle-aerodynamics of trains.	1	
<b>IV</b>	Horizontal and vertical axis machines-energy density of different rotors	2	15%
	Power coefficient	2	
	Betz coefficient by momentum theory	2	
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Pressure distribution on low rise buildings-wind forces on buildings	2	20%
	Environmental winds in city block	2	
	special problems of tall buildings-building codes	1	
	ventilation and architectural aerodynamics	2	
<b>VI</b>	Vortex shedding	2	20%
	lock & effects of Reynolds number on wake formation in turbulent flows - across wind galloping-wake galloping-along wind galloping of circular cables	2	
	oscillation of tall structures and launch vehicles under wind loads-stall flutter.	2	
<b>END SEMESTER EXAM</b>			

### 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.