



Course Title: AEROELASTICITY

Credit Units: 03

Course Code: AERO411

Course Level: UG

L	T	P/S	SW /FW	TOTAL CREDIT UNITS
3	-	-	-	3

Course Objectives

This course is prepared with the objective that the students will gain knowledge of aero-elastic nature of the materials used on an aircraft, its effect on the aerodynamic forces, stability and performance of the aircraft; effects like flutter are studied analytically.

Pre-requisites: Aircraft Structures-I & II, Aerodynamics-I

Course Contents/Syllabus:

	Weightage (%)
Module I : Introduction	20
Descriptors / Topics Definition and historical background, Static and dynamic aero-elastic phenomenon, integration of aerodynamic, elastic and inertia forces, influence of aero-elastic phenomenon on air craft design, comparison of critical speeds.	
Module II : Divergence of Lifting Surface	20
Descriptors/Topics : The phenomenon of divergence, divergence of 2-D wing section, divergence of an idealized cantilever wing, solution based on semi-rigid assumptions, solution to generalized co-ordinates, method of successive approximation, use of numerical methods.	
Module III : Steady State Aero elasticity Problems in General	20
Descriptors/Topics : Loss and reversal of aileron Control: 2D case, aileron reversal general case. Lift distribution on a rigid and elastic wing. Effect on Static Longitudinal stability of airplane.	
Module IV : Introduction to Flutter and Buffeting	20

Descriptors/Topics: The phenomenon of flutter, flutter of a cantilever wing. Approximate determination of critical speed by Galerkin's Method, buffeting and stall flutter--an introduction.	
Module V : Non-Aero elastic Problems	20
Descriptors/Topics : Some typical example in civil engineering, Flow around an oscillating circular cylinder, applications to H-shaped sections & high-speed vehicles, Prevention of aero-elastic instabilities.	

Student Learning Outcomes:

- Describe the phenomenon of aero-elasticity on different components and its effect on aerodynamic characteristics and performance of the aircraft.
- Explain fluttering of wings / control-surfaces during different adverse flight regimes.
- Analyze wing divergence, loss and reversal of controls of the aircraft
- Assess aero-elastic instability in aircraft structures.

Pedagogy for Course Delivery: Session Plan / course-material uploading, Class-room teaching associated with assignments, presentations, quiz, viva-voce and evaluation.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100	NA	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment - 30					End Term Examination
Components (Drop down)	A	CT	S/V/Q	HA	70
Weightage (%)	5	10	8	7	70

Text & References:

- Fung Y.C., “An Introduction to Theory of Aero-elasticity”, Dover Publications, 1st Ed., 1967.
- R.L Bisplinghoff, Holt Ashley and Halfman R.L. “Aero-elasticity”, Addison–Wesley Publishing Co. Reading Mass, 1st Ed,1965

Any other Study Material:

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