Aircraft Structural Dynamics - Web course

COURSE OUTLINE

The course covers a broad spectrum of the subjects, from the very elementary to the more advanced, and is arranged in increasing order of difficulty.

Although the application of structural dynamics in different engineering branches is different, the principles and solution techniques are basically the same.

Therefore this course emphasis on the principles and solution techniques, and illustrates them with numerous examples.

In the first few lectures context of the present subject has been introduced with a correlation to aircraft structures.

Subsequently it introduces structures modeled as single degree-of-freedom system and presents important methods for the solution of such dynamic systems.

Multi degree-of-freedom system related methodology and concept have been discussed in the following few lectures.

Finally mathematical solution for some simple structures modeled as systems with distributed properties and approximate methods related to the structural dynamics have been presented.

Contents:

Introduction to Aircraft Structural Dynamics, Undamped and Damped Single-Degree-of-Freedom Systems, Forced Response of Undamped and Damped Single-Degree-of-Freedom Systems.

Response to General Dynamic Loading, Introduction to Multi-Degree of Freedom Systems, Forced harmonic Oscillation of Multi-Degree of Freedom System, Modal Response Analysis, Normal Mode Vibration of Continuous System, Approximate Methods Related to Structural Dynamic.

COURSE DETAIL

A Web course shall contain 40 or more 1 hour lecture equivalents.

S.No	Topics	No.of Hours
1	Introduction to Aircraft Structural Dynamics.	1
2	Oscillatory Motion and Vibration Terminology.	2
3	Undamped Single-Degree-of-Freedom System.	2
4	Damped Single-Degree-of-Freedom System.	2
5	Forced Response of Undamped Single-Degree-of-Freedom System.	1

NPTEL

http://nptel.iitm.ac.in

Aerospace Engineering

Pre-requisites:

1. Aircraft Structural Analysis.

Additional Reading:

Literature on Advanced Aircraft Structural Dynamics.

Coordinators:

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6	Forced Response of Damped Single-Degree-of-Freedom System.	3
7	Effect on the Support of a Vibrating Structure.	1
8	Determination of Damping Ratio.	1
9	Response to General Dynamic Loading-Impulsive Loading and Duhamel's Integral, Laplace Transformation.	3
10	Numerical Methods Related to General Dynamic Loading.	2
11	Introduction to Multi-Degree of Freedom System.	4
12	Forced harmonic Oscillation of Multi-Degree of Freedom System.	2
13	Modal Response Analysis	4
14	Normal Mode Vibration of Continuous System - Vibrating String, Longitudinal Vibration of Rods. Torsional Vibration of Rods, Euler Equation of Beam.	8
15	Approximate Methods Related to Structural Dynamic - Rayleigh Method. Rayleigh-Ritz Method, Galerkin's Method.	4

References:

1. W. T. Thomson, "Theory of Vibration with Applications", CBS Publishers & Distributors.

2. Leonard Meirovitch, "Elements of Vibration Analysis", Tata McGraw-Hill Publishing Company Limited.

3. Roy R. Craig, Jr., "Structural Dynamics-An introduction to Computer Methods", John Wiley & Sons.

4. Mario Paz, "Structural Dynamics-Theory and Computation", CBS Publishers & Distributors.