

## **AE8008 VIBRATION AND ELEMENTS OF AEROELASTICITY**

### DETAILED SYLLABUS

#### **OBJECTIVES:**

- To study the effect of time dependent forces on mechanical systems and to get the natural characteristics of system with more degree of freedom systems.
- To study the aeroelastic effects of aircraft wing.

#### **UNIT I SINGLE DEGREE OF FREEDOM SYSTEMS**

Introduction to simple harmonic motion, D'Alembert's principle, free vibrations – damped vibrations – forced vibrations, with and without damping – support excitation – transmissibility - vibration measuring instruments.

#### **UNIT II MULTI DEGREE OF FREEDOM SYSTEMS**

Two degrees of freedom systems - static and dynamic couplings - vibration absorber- Multi degree of freedom systems - principal co-ordinates - principal modes and orthogonal conditions - Eigen value problems - Hamilton's principle - Lagrangean equations and application.

#### **UNIT III CONTINUOUS SYSTEMS**

Vibration of elastic bodies - vibration of strings – longitudinal, lateral and torsional vibrations

#### **UNIT IV APPROXIMATE METHODS**

Approximate methods - Rayleigh's method - Dunkerley's method – Rayleigh-Ritz method, matrix iteration method.

#### **UNIT V ELEMENTS OF AEROELASTICITY**

Vibration due to coupling of bending and torsion - aeroelastic problems - Collars triangle - wing divergence - aileron control reversal – flutter – buffeting. – elements of servo elasticity

#### **TEXT BOOKS:**

1. Grover. G.K., "Mechanical Vibrations", 7th Edition, Nem Chand Brothers, Roorkee, India, 2003
2. Leonard Meirovitch, "Elements of Vibration Analysis". McGraw Hill International Edition, 2007
3. Thomson W T, 'Theory of Vibration with Application' - CBS Publishers, 1990.

#### **REFERENCES:**

1. Bisplinghoff R.L., Ashely H and Hogman R.L., "Aeroelasticity", Addison Wesley Publication, New York, 1983.
2. Den Hartog, "Mechanical Vibrations" Crastre Press, 2008.
3. TSE. F.S., Morse, I.F., Hinkle, R.T., "Mechanical Vibrations" – Prentice Hall, New York, 1984.

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[www.AllAbtEngg.com](http://www.AllAbtEngg.com)

4. William W Seto, "Mechanical Vibrations" – McGraw Hill, Schaum Series.
5. William Weaver, Stephen P. Timoshenko, Donovan H. Young, Donovan H. Young. 'Vibration Problems in Engineering' – John Wiley and Sons, New York, 2001