

<b>Course Title</b>	<b>Course Code</b>	<b>Credit Hours</b>
Vibrations and Aeroelasticity	AE-334	3-0

**Textbook:**

- Singiresu S. Rao and Fook Fah Yap, “Mechanical Vibrations”, PrenticeHall

**Reference Books/Materials:**

- Dewey H. Hodges and G. Alvin Pierce, “Introduction to Structural Dynamics and Aeroelasticity.”, Cambridge University Press
- S. Graham Kelly, “Mechanical Vibrations: Theory and Applications”, Cognella, Incorporated
- EASA Part-66 Category B1 Maintenance License Module 2, “Physics”

**Course Objectives:**

This course aims to help students understand fundamental Vibration Theory and its impact on system performance and safety. It covers Single-Degree-of-Freedom (1-DOF) and Multi-Degree-of-Freedom (multi-DOF) systems, responses to Harmonic Forces, and Aeroelasticity principles.

**Course Outline:**

- Classification of Vibrations and Basic Concepts
- Spring-Mass-Damper System Fundamentals
- Harmonic Analysis Procedures for Vibrations
- Free Vibration Analysis of Single-Degree-of-Freedom (SDOF) Systems
- Effects of viscous, Coulomb, and Hysteretic Damping
- Free Vibration Analysis of Torsional Systems
- Harmonic Excitation and Equation of Motion
- Response Analysis of Damped and Un Damped Systems
- Harmonic Motion of the Base and Rotating Unbalance
- Forced Vibration Analysis with Coulomb Damping
- Vibration Response to Periodic and Irregular Excitation
- Non-Periodic Force Response Analysis
- Two-Degree-Of-Freedom (TDOF) System Equations of Motion
- Forced and Free Vibration Analysis for TDOF Systems

- Multi-Degree-Of-Freedom (MDOF) System Equations of Motion
- Derivation of Generalized Coordinates and Influence Coefficients
- Free and forced Vibration Analysis for MDOF Systems
- Introduction to Static and Dynamic Aero Elasticity
- Divergence, Control Reversal, Buffet, and Flutter issues in Aircraft