

Course Title	Course Code	Credit Hours
Aircraft Structural Analysis	AE-333	3-0

**Textbooks:**

- Thomas Henry Gordon Megson, "Aircraft structures For Engineering Students", Butterworth-Heinemann
- Bruce K. Donaldson, "Analysis of Aircraft Structures", Cambridge University Press

**Reference Book:**

- Ferdinand Pierre Beer, Elwood Russell Johnston, John T. DeWolf, David Francis Mazurek and Sanjeev Sanghi "Mechanics of Materials", McGraw-Hill Education Ltd

**Course Objectives:**

This course aims to help students understand Structural Theory for Aerospace Vehicles, covering Elasticity, Beam Bending, Torsion, and Shear. It also explores advanced topics like Composites, Buckling, and Structural Load Analysis.

**Course Outline:**

- Introduction and Basic Concepts, Loads on Aircraft.
- Linear Theory of Elasticity
- Hooke's Law, Equilibrium Equation,
- Boundary and Compatibility Conditions.
- Bending and Extension of Beams:  
Stress Resultants, Normal stresses, Beam Displacement,
  - Area Properties of Non-Homogeneous Cross-Section; Thermal Loads.
  - Uniform Torsion of Beams: Stress Formulation, Prandtl Stress Function and Membrane Analogy
  - Closed form and Open Form Solutions of Torsion Problems,
  - Torsion of Open and Closed Section Beams.
  - Beam under Shearing Force: Thin-Walled Open Section, Shear Center and Thin Walled Closed section.

- Energy Methods for Structure Analyses: Strain Energy and Complementary Energy and Total Potential Energy
- Principal of Virtual Work and its Application to Calculate Deflection, Statically Indeterminate System, Unit Load Method.
- Structure Stability: Effect of Initial Imperfection of Columns, Secant Formula.
- Composite Material Mechanical Behavior.