THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Flight Vehicle Structures II

AEROENG 3543

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Energy Based Analysis: Principles of virtual work and minimum potential energy; rayleigh-ritz and finite element methods; structural stability; thermo-elasticity; structural dynamics; laboratory demonstrations.

Prerequisites and Co-requisites:
Prereq: 3542 (342), and enrollment as AeroEng-BS student (No pre-majors can enroll in this class).

Course Goals / Objectives:
- Introduce undergraduate aerospace engineering students to fundamental concept of energy based approaches with applications to approximate methods (e.g., Rayleigh-Ritz and the Finite Element Method), structural stability, and structural dynamics

Course Topics:

- Review of Concepts from AE 3542. Energy Approaches. Indicial Notation. Elastic Strain Energy for Linear Isotropic Materials. Work of Applied Generalized Forces.
- Calculus of Variations. Basic Goal. Euler-Lagrange Equations. Natural vs. Geometric Boundary Conditions. Variation of Work and Strain Energy
- Principles of Virtual Work and Minimum Potential Energy - Derivations and Explanations. Castigliano's Two Theorems.
- Approximate Approaches. Rayleigh-Ritz. Introduction to FEM: axial elements, truss elements, beam elements.
- Structural Stability. Bifurcation and Limit Load Instabilities. Stability Concepts via Discrete Degree of Freedom Systems. Buckling of Continuous Columns.
- Thermo-Elasticity and Thermal Buckling.
- Structural Dynamics. Review of Discrete Systems. Continuous 1-D Structures. Hamilton's Principle. Free Vibration. Introduction to Concepts of Aeroelasticity
- Laboratory Experiments/Demonstrations: Cantilever Flexure; Stress and STrain Concentration; Cantilever Buckling; Free Vibration of Beams.

Designation:
Required