

AE 6115 Fundamentals of Aerospace Structural Analysis

HOURS: 3-0-3

CATALOG DESCRIPTION (25 words or fewer):

Overview and fundamentals of aerospace structural analysis, including virtual work and energy methods, buckling and advanced structural theories.

PREREQUISITES:

COE 3001

TEXTBOOKS:

Structural Analysis by O.A. Bauchau and J. I. Craig, Springer 2009

COURSE OBJECTIVES:

Fundamentals of structural analysis with emphasis on virtual work and energy principles; application of these principles to the formulation of advanced structural theories; understanding of structural buckling and the determination of critical loads.

LEARNING OUTCOMES:

Students will be able to:

1. Solve for the stresses and displacements in a structure, which may be either determinate or indeterminate and loaded under a combination of axial, shearing, bending and torsional loads.
2. Construct advanced structural theories (e.g. composite or sandwich structures).
3. Derive critical loads and study the nature of buckling in a structure loaded in compression.

GRADING:

Midterm Exams(2): 60%

Final Exam: 40%

LEARNING ACCOMMODATIONS:

If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the ADAPTS office (<http://www.adapts.gatech.edu>).

TOPICAL OUTLINE:

Topic	Lecture Hours
I. Course Overview and Background	1
II. Virtual Work Principles	8
A. Principle of Virtual Displacements	3
B. Principle of Virtual Forces	2.5
C. Unit Load Method	2.5
III. Energy Principles	8
A. Potential and Strain Energy	3
B. Complementary Potential	2.5
C. Castigliano's theorem	2.5
IV. Technical Theory of Beams and Advanced beam Theories	7
A. Derivation of the Technical Theory of Beams	3
B. Timoshenko Beam Theory	4
V. Structural Buckling	10
A. Fundamental Concepts of Structural Buckling	3
B. Column Buckling (Euler Load)	4
C. Buckling of Frames	1.5
D. Post-Buckling and Elastica Theory	1.5
V. Thin-Walled Structures	8
A. Shear Flow in Thin-Walled Beams	3
B. Torsion of Thin-Walled Beams	3
C. Multi-Cell Thin-Walled Sections	2
Tests/Exams/Reviews	3
Total	45