AE 6100 Structural Stability I

Catalog Data: AE 6100. Structural Stability I

3-0-3. Prerequisite: Undergraduate structures course or consent of instructor.

Introduction to stability of elastic systems under quasi-static loads. Discussion of the classical, kinetic and potential energy approaches through simple mechanical rigid member models. Buckling of elastic bars including the effects of boundary conditions and eccentricities. Buckling of frames. The energy criterion and energy-based methods.

Textbook: G.J. Simitses, *An Introduction to the Elastic Stability of Structures*, Krieger, 1986.

Faculty: **G.A. Kardomateas** (AE), **D. H. Hodges** (AE)
Coordinator: **G.A. Kardomateas**

Lecture Topics:
1. The Concept of Instability and Buckling/Postbuckling
        a. Adjacent equilibrium and bifurcation.
        b. Snapthrough buckling.
2. Mechanical Rigid Member Models
        a. One and two degree of freedom models.
        b. Snapthrough model.
        c. Imperfect geometry model.
3.   Elastic Buckling of Columns.
        a. Effect of boundary conditions.
        b. Effect of imperfections and eccentricities.
        c. The Southwell plot.
4. Buckling of Frames
        a. Beam-column theory.
        b. Symmetric and antisymmetric buckling modes.
5. Energy-Based Methods
        a. Timoshenko's method.
        b. Rayleigh and Timoshenko quotient.
6. Buckling of beam-columns on elastic foundation
7. Torsional Buckling
        a. Torsion of thin-walled bars and torsional buckling
        b. Buckling by torsion and flexure
8. Lateral Buckling of Beams
        a. Lateral buckling of beams in pure bending
        b. Lateral buckling of simply supported I-beams
        c. Other cases of lateral buckling

Computer Usage: None

Laboratory Projects: None