STABILITY OF STRUCTURES
(Professional Elective-III)

Course Code: 19CE2257

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The students will be able to:

CO 1. Analyze the buckling behavior of columns.
CO 2. Analyze the buckling behavior of framed structures.
CO 3. Analyze the lateral torsion buckling of flexural members.
CO 4. Analyze the buckling of plates.
CO 5. Analyze the inelastic buckling of columns and plates.

UNIT I: BUCKLING OF COLUMNS   (10-Lectures)

States of equilibrium – Classification of buckling problems – concept of equilibrium, energy, imperfection and vibration approaches to stability analysis – Eigen value problem, governing equation for columns – Analysis for various boundary conditions – using Equilibrium, Energy methods. Approximate methods – Rayleigh Ritz, Galerkins approach – Numerical Techniques – Finite difference method – Effect of shear on buckling.
LO1: Understand the concept of equilibrium in column buckling.
LO2: Describe the influence of shear on buckling through numerical Techniques.

UNIT II: BUCKLING OF BEAM-COLUMNS AND FRAMES
(10-Lectures)
Theory of beam column – Stability analysis of beam column with single and several concentrated loads, distributed load and end couples, Analysis of rigid joint frames with and without sway – Use of stability function to determine the critical load.
LO1: Understand the concept of stability for beam column
LO2: Analysis and design of rigid joint frames based on stability concept.

UNIT III:
TORSIONAL AND LATERAL BUCKLING   (10-Lectures)
Torsional buckling – Combined Torsional and flexural buckling – Local buckling. Buckling of Open Sections, Numerical solutions. Lateral buckling of beams, pure bending of simply supported and cantilever beams. Concept of warping

LO1: Understand the concept of lateral torsional buckling for open sections.
LO2: Design of beams for lateral torsional buckling and pure bending conditions.

UNIT IV: BUCKLING OF PLATES   (10-Lectures)

Governing differential equation – Buckling of thin plates, four side conditions –Analysis by equilibrium and energy approach – Finite difference method.
LO1: Understand the concepts involved in buckling of plates
LO2: Analyze the plates using energy approach and Finite Difference Method.

UNIT V: INELASTIC BUCKLING   (10-Lectures)

Double modulus theory – Tangent modulus theory – Shanley's model – Eccentrically loaded inelastic column, Inelastic buckling of plates – Post buckling   ehavior of plates.
LO1: Understand the concept of inelastic buckling theories
LO2: Analyze the inelastic buckling of plates and post buckling behavior.

Text Books
1. Timoshenko.S.P, and Gere.J.M, ‒Theory of Elastic Stability‖, McGraw Hill Book Company, 1963.
2. Chajes, A. ‒Principles of Structures Stability Theory‖, Prentice Hall, 1974.

References:
1. Ashwini Kumar, ‒Stability Theory of Structures‖, Allied publishers Ltd., New Delhi, 2003.
2. Gambhir, ‒Stability Analysis and Design of Structures‖, Springer, New York, 2004.
3. Simitser.G.J and Hodges D.H, ‒Fundamentals of Structural Stability‖, Elsevier Ltd., 2006.