COURSE CONTENT

STABILITY ANALYSIS OF STRUCTURES								
I Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BSTE09	**Elective**	3	0	0	3	40	60	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Analysis of Structures								

I. COURSE OVERVIEW:

Structural stability is a fundamental requirement in the safe and efficient design of engineering structures. This course introduces the concepts of stability, strength, and stiffness, and develops the classical criteria for analyzing discrete and continuous systems under linear and nonlinear behavior. It covers the elastic buckling of columns and beam–columns under various loading and boundary conditions, including the effects of eccentricity, shear, and elastic foundations. The stability of frames is examined with emphasis on member versus global buckling and slenderness considerations. Further, the course explores the lateral torsional buckling of beams and the buckling of thin plates under axial, shear, and combined loading conditions, including inelastic and dynamic stability effects. Completion of this course equips students with the analytical tools necessary to evaluate and design stable structural systems used in modern engineering practice.

II. COURSE OBJECTIVES:

The student will try to learn:

I. Explain the fundamental concepts of stability, strength, and stiffness, and apply stability criteria to discrete and continuous structural systems under linear and nonlinear behavior.
II. Analyze the elastic buckling of bars and columns under different loading and support conditions using classical and energy methods, including the effects of shear, eccentricity, and variable cross-sections.
III. Evaluate the stability of structural frames by distinguishing between member buckling and global buckling and determine critical loads using differential equations and slenderness ratio concepts.
IV. Examine the lateral torsional buckling of beams and the buckling behavior of plates under axial, shear, and combined loads, including inelastic and dynamic stability effects.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	Explain the fundamentals of stability, strength, and stiffness, and apply stability criteria to discrete and continuous systems under linear and nonlinear behavior.
CO 2	Analyze the elastic buckling of columns under axial, eccentric, and lateral loading using both classical and energy methods
CO 3	Evaluate the behavior of beam–columns and bars on elastic foundations, and determine critical loads under varying loading and cross-sectional conditions.
CO 4	Assess the stability of structural frames by distinguishing between member buckling and global buckling, and apply differential equation and slenderness ratio methods to compute critical loads.
CO 5	Analyze the lateral torsional buckling of beams under different boundary and loading conditions, and apply approximate and exact methods for determining buckling strength.
CO 6	Examine the buckling of thin plates under axial, shear, and combined loads, including the effects of inelastic behavior and dynamic stability

IV. COURSE CONTENT:

MODULE - I: CRITERIA FOR DESIGN OF STRUCTURES (09)
Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

MODULE - II: ELASTIC BUCKLING OF BARS (9)
Elastic Buckling of Straight Columns –Effect of Shear Stress on Buckling-Eccentrically and Laterally Loaded Columns –Energy Methods –Buckling of A Bar on Elastic Foundation, Buckling of a bar with Intermediate Compressive Forces and Distributed Axial Loads –Buckling of Bars With Change in Cross Section –Effect of Shear Force on Critical Load – Built Up Columns.

MODULE - III: STABILITY OF FRAMES (10)
Introduction, modes of buckling, Member Buckling versus Global Buckling, critical load using various methods.

Differential equation buckling, Relative slenderness, Slenderness Ratio of Frame Members.

MODULE - IV: STABILITY OF BEAMS (8)
Lateral torsion buckling, Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.

MODULE - V: STABILITY OF PLATES (09)
Axial flexural buckling, shear flexural buckling, buckling under combined Loads. Introduction to Inelastic Buckling and Dynamic Stability.

V. TEXTBOOKS:

1. Timoshenko and Gere, "*Theory of elastic stability*", Tata McGraw Hill,1981.
2. Alexander Chajes, "*Principles of Structural Stability Theory*", Prentice Hall, New Jersey, 1992.

VI. REFERENCE BOOKS:

1. Iyengar, N. G. R, "*Structural Stability of columns and plates*", Eastern west press Pvt. Ltd, 1996.
2. Bleich F. Bucking, "*Strength of Metal Structures*", Tata McGraw Hill, New York, 2001.

VII. ELECTRONICS RESOURCES:

1. http://nptel.ac.in/courses/105106116/10
2. https://www.colorado.edu/engineering/CAS/courses.d/Structures.d/IAST.Lect23.d/IAST.Lect23.Slides.pdf

VIII. MATERIALS ONLINE:

1. Course Outline Description
2. Tutorial Question Bank
3. Assignments
4. Model Question Paper – I
5. Model Question Paper - II
6. Lecture Notes
7. Early Lecture Readiness Videos
8. Power point presentation