

**M. Tech I, Year: Semester– I**

**Subject Name:** Structural Stability

**Subject Code:** MTST14103

**Type of course:** PE- I

**Prerequisite:**Structural Analysis 1

**Rationale:**Students will able to understand the stability of structure and able to evaluate structural stability of columns, frames.

**Teaching and Examination Scheme:**

| TEACHING SCHEME |   |   |   | Theory Marks |     |     | Practical Marks |     | Total |
|-----------------|---|---|---|--------------|-----|-----|-----------------|-----|-------|
| L               | T | P | C | TEE          | CA1 | CA2 | TEP             | CA3 |       |
| 3               | 0 | 2 | 4 | 60           | 25  | 15  | 30              | 20  | 150   |

**CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

**Content:**

| Sr. No. | Content  | Total Hrs | Module Weightage % |
|---------|--|-----------|--------------------|
| 1       | <b>Introduction</b> , Static equilibrium – Governing equation for columns – Analysis for various boundary conditions.  | 5         | 12%                |
| 2       | <b>Analysis of Columns</b> , Eccentrically loaded column and Initial Imperfect column -Numerical Problems  | 6         | 14%                |
| 3       | <b>Theory of Beam column</b> – Stability analysis of beam column with different types of loads – Failure of beam columns.  | 7         | 17%                |
| 4       | <b>Analysis and stability of frames</b> , Various Boundary Conditions – Differential equations – Slope Deflection method   | 7         | 17%                |
| 5       | <b>Torsional buildings</b> , Torsional load-Deformation characteristics of structural members- strain energy of torsion – Torsional and flexural torsional buckling of columns | 7         | 17%                |
| 6       | <b>Buckling of plates</b> , Differential Equation of plate buckling – linear theory – critical load of a plate uniformly compressed in one direction.                          | 4         | 9%                 |
| 7       | <b>Buckling of shells</b> , Differential equation – Analysis – Application   | 4         | 9%                 |
| 8       | <b>Contemporary issues</b>   | 2         | 5%                 |

**Suggested Specification table with Marks (Theory):**

| Distribution of Theory Marks |         |         |         |         |         |
|------------------------------|---------|---------|---------|---------|---------|
| R Level                      | U Level | A Level | N Level | E Level | C Level |
| 25%                          | 20%     | 25%     | 15%     | 10%     | 10%     |

**Legends:** **R:** Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze and **E:** Evaluate, **C:** Create and above Levels (Revised Bloom's Taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

| Sr no | Title of book /article   | Author(s)                          | Publisher and details like ISBN | Year of publication | Publication Edition     |
|-------|--|------------------------------------|---------------------------------|---------------------|-------------------------|
| 1.    | Elastic Stability of Structural Elements,  | Iyengar. N.G.R. (2007)             | McMillan, New Delhi             | 2007                | 1 <sup>st</sup> Edition |
| 2.    | Structural Stability of Steel: Concepts and Applications for Structural Engineers, | Galambos. T.V., Surovek A. E(2008) | Wiley, London                   | 2008                | 1 <sup>st</sup> Edition |
| 3.    | Principles of Structural Stability Theory  | Alexander Chajes                   | Prentice Hall                   | 1974                | 1 <sup>st</sup> Edition |
| 4.    | Stability of structures: principles and application                                | Chai Yoo Sung Lee                  | Elsevier Oxford UK              | 2011                | 1 <sup>st</sup> Edition |

**Course Outcomes:**

| Sr. No. | CO statement   | Marks % weightage |
|---------|--|-------------------|
| CO-1    | To understand the difference between stability and instability (Cognitive Level-U&A) | 20%               |
| CO-2    | To Evaluate the structural stability of columns, frames (Cognitive Level-E&N)        | 20%               |
| CO-3    | To understand column eccentricity with respect of stability (Cognitive Level-U&A)    | 15%               |
| CO-4    | Know the buckling parameter of plates and shells (Cognitive Level-R)                 | 25%               |
| CO-5    | Able to understand torsional loads in structures (Cognitive Level-U)                 | 20%               |

**FOR TUTORIAL SESSION:**

**List of Practical:(With analysis design and all necessary drawings)**

Design minimum two structures as per syllabus and parameters cover the stability of buildings