Structural Mechanics
List of Topics

Spring semester 2016

Lecturer: Prof. S.V. Sheshenin

1. Introduction. Understanding the safe design.
2. Structural members under axial loads. Tension and Compression. Normal Stress and Strain.
3. System of Units.
4. Mechanical Properties of Materials. Stress-Strain Diagram. Elasticity and Plasticity.
5. Statically determinant and indeterminant uniaxial problems.
6. Non-uniform bar under uniaxial load. Bars with continuously varying cross sections and continuously varying load. Strain Energy for non-uniform bars.
7. Thermal Effects. Thermal strain and stress in bar. Thermo-elasticity.
8. Examples of Axial Loaded Members.
9. Shear Stress and Strain.
10. Allowable stresses and allowable loads. Factors of safety.
11. Strain Energy in non-uniform tension.
12. Calculation of truss.
13. Torsion. Angle of twist and rate of twist. Formulas for shear strain and shear stress.
14. Torsion formula.
15. Non-uniform torsion. Bar with continuously varying cross sections and continuously. varying torque.
16. Strain energy in non-uniform torsion.
17. Stress concentration in tension and torsion.
18. Beams. Pure bending and bending by lateral forces. Concentrated and distributed forces.
19. Shear force and bending moment diagrams.
20. Normal and shear stresses in a beam of rectangular cross section.
21. Flexure and shear formulas.
22. Thin-Walled Tubes.
23. Nonlinear Torsion of Circular Bar.
24. Shear stresses in the webs
25. Shear stresses in the web of beams with flanges.
26. Built-up beams and shear flow.
27. Beams with axial loads. Eccentric loads.
28. Deflection of Beams. Equations of deflection curve (equations of 2nd, 3rd and 4th orders).
29. Nonprismatic Beams.
30. Statically Indeterminate Beams.
31. Columns. Euler Buckling. Critical Loads. Effect of boundary conditions.
32. Columns with Eccentric Axial Loads. Secant Formula for Columns.
33. Tangent-modulus Theory.
34. Composite Beams. Sandwich beam.
35. Doubly symmetric beams with inclined loads.
36. Pure bending of unsymmetrical beam.
37. Shear stresses in beams of thin-walled open cross sections.
38. Shear stresses in a wide-flange beam. The shear center concept.

Text book: J. M. Gere and S.P. Timoshenko "Mechanics of Materials" , Brooks/Cole, Thomson Learning.