

Syllabus of AS 2010

Chapter 1. Stress

- Equilibrium
- average normal stress in axially loaded bar
- average shear stress
- allowable stress design

Chapter 2. Strain

- Deformation
- Strain

Chapter 3. Mechanical properties of materials

- Tension-compression test
- Stress-strain diagram for ductile and brittle materials
- Hooke's law
- Strain energy
- Poisson's ratio
- Failure of materials by creep and fatigue

Chapter 4. Axial load

- Saint-Venant's principle
- Elastic deformation of axially loaded bar
- Superposition principle
- Statically indeterminate axially loaded member
- Force method of analysis for axially loaded members
- Thermal stress
- Stress concentration
- Inelastic axial deformation and residual stress

Chapter 5. Torsion

- Torsional deformation of a circular shaft
- Torsion formula
- Power transmission and angle of twist
- Statically indeterminate torque-loaded members
- Inelastic torsion

Chapter 6. Bending

- SFD and BDM diagrams
- Graphical method for the construction of SFD and BMD
- Bending deformation of a straight member and flexural formula
- Composite beam

Chapter 7. Transverse shear

- Shear in straight members
- The shear formula and introduction to shear flow

Chapter 8. Combined loadings

- Thin-walled pressure vessels
- State of stress caused by combined loadings

Chapter 9. Stress transformation

- Plane-stress transformation
- Principal stresses and maximum in-plane shear stress
- Mohr's circle- Plane stress, and absolute maximum shear stress

Chapter 10. Strain transformation

- General equations of plane strain transformation
- Mohr's circle-Plane strain, and absolute maximum shear strain
- Strain rosettes, and material property relationships
- Theories of failure

Chapter 11. Design of beams and shafts

- Prismatic beam design
- Fully stressed beams
- Shaft design

Chapter 12. Deflection of beams and shafts

- The elastic curve
- Slope and displacement by integration
- Discontinuity functions
- Slope and displacement by the moment-area method
- Method of superposition
- Statically indeterminate beams and shafts-
 - Method of integration
 - Moment-area method
 - Method of superposition

Elasticity

- Introduction
- Field equations
- Airy's stress functions
- 2-D plane-stress problems in Cartesian coordinates
- Lamé's solution for thick cylinders

Reference books

- 1) R. C. Hibbeler, *Mechanics of materials*, Pearson.
- 2) E. P. Popov, *Engineering mechanics of solids*, Prentice-hall.
- 3) A. P. Boresi, R. J. Schmidt, *Advanced mechanics of materials*, John Wiley and sons.

Evaluation

Quiz 1: 20 %

Quiz 2: 20 %

Assignment: 10 %

End sem.: 50 %