## MSE-821 Mechanical Behavior of Materials - 3 CHs

Prerequisite - Nil
Category: Elective Course

| Existing Course Contents | Proposed Changes |
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| **Course contents:**<br>• Shear Forces and Bending Moments, Torsion, Analysis of Stress and Strain,<br>• Shear stress and plastic deformation, Critical resolved shear stress for slip, Slip systems,<br>• Generation and mutual interactions of dislocations, Tension test & Stages of fatigue.<br>• Compression and hardness testing, Types of fracture, Fracture Mechanics,<br>• Rate and Temperature dependent deformation, Visco-elastic Behavior, Impact testing,<br>• Creep deformation, Creep rupture, Fatigue failure, Stress cycles and S-N curve. | **Course contents:**<br>• Elastic stress-strain relationship; Strain energy density; Shear stress and strain; Pure shear; Biaxial state of stress; Mohr's circle; Triaxial state of stress; Elastic anisotropy; Visco-elasticity; Plastic deformation of metals in tension and compression; Bauschinger's effect; True stress-strain relation and the flow stress; Failure criteria.<br>• Atomic point defects; Observation, behaviour, stress field, energy and sources of dislocations; Peierls-Nabarro stress; Dislocations in various structures (fcc, bcc, hcp); Dislocation movement, interaction and pile-up; Strain hardening in the fcc; temperature and strain rate effects; Strengthening mechanisms in metals (work hardening, grain size, solid solution, particle strengthening); Development of crystalline solids for maximum strength.<br>• Fracture and fracture mechanism(s); Creep and super-plasticity; Fatigue; Martensitic transformation. |

**Proposed Weekly Plan for the Concerned Faculty**

| Week/Lecture | Topic |
|---|---|
| 1-6 | Elastic stress-strain relationship; Strain energy density; Shear stress and strain; Pure shear; Biaxial state of stress; Mohr's circle; Triaxial state of stress; Elastic anisotropy; Visco-elasticity; Plastic deformation of metals in tension and compression; Bauschinger's effect; True stress-strain relation and the flow stress; Failure criteria. |
| 7-14 | Atomic point defects; Observation, behaviour, stress field, energy and sources of dislocations; Peierls-Nabarro stress; Dislocations in various structures (fcc, bcc, hcp); Dislocation movement, interaction and pile-up; Strain hardening in the fcc; temperature and strain rate effects; Strengthening mechanisms in metals (work hardening, grain size, solid solution, particle strengthening); Development of crystalline solids for maximum strength. |
| 15-17 | Fracture and fracture mechanism(s); Creep and super-plasticity; Fatigue; Martensitic transformation. |