

	National University of Sciences and Technology	
	Course Description	
Course Title Mechanical Behavior of Materials	Course Code MSE 821	Credit Hours 3 – 0

Textbook:

Mechanical-behavior-of-engineering-materials by Joachim Roesler

Reference Books:

- Mechanical behavior of materials by William S Hosford
- Mechanical Behavior of Engineering Materials by Yehia Haddad

Course Objective:

- This course is intended to give understanding of the basic chemistry on atomic level and their effect on mechanical properties of materials. How the mechanical properties are related to crystal structure of metals and ceramics and their ability of alloying. Course will also cover elastic and plastic deformation phenomenon along with some emphasis on failure criteria and prevention. The students will have a fair idea of dislocations in material and strengthening of materials.

Course Outline:

Elastic stress-strain relationship; Strain energy density; Shear stress and strain; Pure shear; Biaxial state of stress; Mohr's circle; Tri-axial 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, Atomic point defects; Observation, behavior, 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. Fracture and fracture mechanism(s); Creep and super-plasticity; Fatigue;

ASSESSMENTS

Description	Percentage Weightage (%)
Assignments	05-10%
Quizzes	10-15%
Mid Semester Exams	30-40%
End Semester Exam	40-50%