

ME 679 Mechanical Behavior of Materials (3-0-0-6)

Offered to: UG & PG

Introduction: review of elastic and plastic behavior and crystal structure of materials; Isotropic and anisotropic properties of cubic and noncubic crystals; Crystal plasticity: dislocation geometry and energy, dislocation mechanics, slip system, hardening, yield surface, micro-to-macro plasticity; Strain-rate and temperature dependence of flow stress, superplasticity; Mechanical Twinning, Martensitic transformation, Shape memory and superelasticity; Hardening mechanisms in metals; Concept of fatigue, fracture, creeps and stress rupture; Rheological behavior: Viscoelasticity; Residual stress; Flow and deformation behavior of polymer, ceramics and glasses; Deformation behavior of metal sandwich plate and metal-matrix composite material

Textbooks:

- [1] William F. Hosford, Mechanical Behaviour of Materials, Cambridge University Press, New York, USA, 2005.
- [2] Marc A. Meyers and Krishan Kumar Chawla, Mechanical Behaviour of Materials, 2nd revised eds, Cambridge University Press, New York, USA, 2008.

References:

- [1] D.W.A. Rees, Basic Engineering Plasticity, Elsevier India, New Delhi, 2008.
- [2] C Lakshmana Rao and Abhijit P Deshpande, Modelling of Engineering Materials, Ane Books Pvt. Ltd., New Delhi, India, 2010.
- [3] John D. Verhoeven, Fundamentals of Physical Metallurgy, Wiley, 1975.
- [4] TH Courtney, Mechanical Behaviour of Materials, 2nd eds, McGraw-Hill International eds, 2000.
- [5] G E Dieter, Mechanical metallurgy, 3rd revised eds, Mgh, 1989.
- [6] Donald R. Askeland and Pradeep P. Phule, The Science and Engineering of Materials, 4th Eds, Thomson, Singapore, 2003.
- [7] J. Chakrabarty, Theory of plasticity, 3rd Eds, Elsevier India, 2009.
- [8] Robert E. Reed-Hill, Physical Metallurgy Principles, 2nd Editions, East-West Press Pvt. Ltd, New Delhi, 2008.