



Course:

Plasticity (Theory and Applications)

Instructor: Dr. M. Asgari

Time: Saturday and Monday, 7:30-9:00.

Web site: <http://wp.kntu.ac.ir/asgari/courses.html>

Syllabus (Main Topics):

- Introduction
 - What is concerned in different theories of plasticity?
- Stress and Strain Analysis
 - Basic experiment
 - Stress-strain behavior
 - Stress and strain invariant
 - Deviatoric and Octahedral stress and strain
- Foundations of Plasticity
 - High-Westergaard stress space
 - Yield criteria and yield surfaces
 - Hardening theories
 - Rule of plastic flow and stress-strain relations
 - Drucker's Postulate
 - Incremental and Deformation theories
- Kinematic Hardening and Cyclic Plasticity Models
 - Cyclic plastic loading
 - Multisurface model
 - Two-surface model
 - Nonlinear models
 - Shakedown and Cyclic Creep Phenomena
- Elastoplastic Solutions including Strain Hardening
 - Elastoplastic Bending and Compression
 - Elastoplastic Solutions of Cylinders and Spheres
 - Elastoplastic Torsion
 - Elastoplastic Problems with Thermal loading
 - Method of Successive Approximations
- Limit Analysis
- Theory of Slip-Line Field and Applications

Required Text:

- J. Chakrabarty, *Theory of Plasticity*, 3rd Edition, 2006.
- Akhtar S. Khan, S. Huang, *Continuum Theory of Plasticity*, John Wiley and Sons, 1995.
- *Class Notes on Selected Subjects.*

Additional References:

- R. Hill, *The mathematical theory of plasticity*, Clarendon Press, 1950.
- W. Johnson, P. Mellor, *Plasticity for mechanical engineers*, D. Van Nost. Reinhold Co, 1962.
- A. Mendelsohn, *Plasticity: Theory and Application*, Mcmillan Publishing, 1968.
- L. Kachanov, *Foundations of the theory of plasticity*, North-Holland Publishing, 1971.
- W. Johnson, P. Mellor, *Engineering Plasticity*, D. Van Nost. Reinhold Co, 1973.
- J. Lubliner, *Plasticity theory*, Mcmillan Publishing Company, 1990 (revised: 2006).
- Vlado A. Lubarda, *Elastoplasticity Theory*, CRC Press, 2001.
- Han Chin Wu, *Continuum Mechanics and Plasticity*, CRC Press, 2004.
- D. Rees, *Basic Engineering Plasticity*, Butterworth-Heinemann, 2006.
- K. Hashiguchi, *Elastoplasticity Theory*, Springer, 2009
- J. Chakrabarty, *Applied Plasticity*, Springer, 2009.

Topics for extra study and course seminar:

- Computational Methods in Plasticity,
- Creep Behavior,
- Viscoplasticity,
- Advances in Ratcheting Simulation,
- Plasticity Modeling in LS-Dyna and other Related Software,
- Modern Hardening Theories,
- Endochronic Plasticity Theory,
- Dynamic Plasticity
- and etc.

Grading

- Homework
- Midterm exam
- Final Exam
- Term Project