

Course:

## **Introduction to Continuum Mechanics**

**Instructor:** Dr. M. Asgari

**Office hours:**

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

**Syllabus (Main Topics):**

- What is Continuum Mechanics?
- Mathematical Preliminaries
  - Index Notation and Summation Convention
  - Tensor Algebra
  - Tensor Field and Calculus
  - Divergence and Stokes' Theorems*
- Kinematics of Continuum
  - Material and Special Descriptions
  - Deformation and Deformation Rates
  - Finite and Infinitesimal Strain Tensors
- Stress
  - Cauchy Stress Tensor
  - Piola Kirchhoff Stress Tensors
- Conservation Laws and Thermodynamics
  - Balance of Mass
  - Balance of Linear and Angular Momentum
  - First Law of Thermodynamics (Balance of Energy)
  - Second Law of Thermodynamics (Entropy Production Inequality)
  - Integral Formulation of general principles
- Classical Constitutive Equations and Elastic Solid
  - Isotropic Linear Elasticity
  - Anisotropic Linear Elasticity
  - Infinitesimal Theory of elasticity and some examples
- Newtonian Fluid

***Required Text:***

- W. Michael Lai, David Rubin, Erhard Krempl, Introduction to Continuum Mechanics1, 4<sup>th</sup> Ed., 2009.
- *Class Notes on Selected Subjects.*

***Additional References:***

- G. Thomas Mase, George E. Mase, Continuum Mechanics for Engineers, 2nd Edition, 1999.
- Wilhelm Flügge, Tensor analysis and continuum mechanics, 1972.
- Clifford A. Truesdell, The Elements of Continuum Mechanics, 1985.
- Y. C. Fung - A first course in continuum mechanics, 1993
- Lawrence E. Malvern, Introduction to the Mechanics of a Continuous Medium, 1969
- P. Chadwick, Continuum Mechanics: Concise Theory and Problems, 1st Ed. 1999.
- J. M. Spencer, Continuum Mechanics, 1980.
- J. N. Reddy, An introduction to continuum mechanics with applications, 2007.
- J. N. Reddy, Principles of Continuum Mechanics A Study of Conservation Principles with Applications, 2010.
- Ray M. Bowen, Introduction to continuum mechanics for engineers, 1989.
- Morton E. Gurtin, An Introduction to Continuum, 1981.

***Grading***

- Homeworks
- Midterm Exam
- Final Exam
- Research Project