Mechanics of Materials and Structures, Spring 2014

Instructor: Giuseppe Tomassetti

Course format:
2 Hours Lecture, 1 Hour Exercise

Term:
Spring Semester

Recommended background:
Linear Algebra
Integral and differential calculus.
General Physics (Mechanics)

Course contents:
- Free and constrained systems, constraints and their classification, possible and virtual displacements, ideal constraints, D'Alembert's Principle.
- Truss structures, beams and frames, the force method, the deformation method, stability of beams and frames.
- The geometry of deformation, transmission of force, elastic constitutive theory, boundary-value problems in Elasticity, yield conditions.
- Extension, bending, torsion, and shear of prismatic bars; thin-walled beams.
- Energetic principles, the Ritz method, the Galerkin method, the Finite Element Method.

Learning outcomes:
This course is designed to introduce basic principles of statics for rigid and deformable bodies. The main objective is to help the students develop an intuition for equilibrium, properly constrained systems, and deformation under external loadings. Students will also know how to program the Finite Element Method.

Textbooks:
S. Krenk and J. Høgsberg: Statics and Mechanics of Structures, Springer 2013

Other reference books:
K. D. Hjelmstad: Fundamentals of Structural Mechanics, Springer 2005
A. Jhennane: Introduction to Finite Element Analysis Using MATLAB and Abaqus, CRC Press 2013
F. Gantmacher: Lectures in Analytical Mechanics, MIR Publishers 1975
T.J. Oden and E.A. Ripperger: Mechanics of Elastic Structures – Second Edition, McGraw-Hill 1981
M.S. Gockenbach: Understanding and Implementing the Finite Element Method, SIAM 2006

Performance record:
Written and oral examination

Workload:
90 hours attending lectures
180 hours study