

MECHANICS OF SOLIDS AND MATERIALS (9 CFU, 2nd semester, in English)

Placements and motions. Rigid and homogeneous deformations. Deformation gradient, stretch and rotation. Stretching and spin. Test velocity fields and force distributions. External and internal force distributions. Balance principle and stress. Balance equations. Frame indifference principle. Affine bodies. Cauchy continuum. Cauchy stress and Piola-Kirchhoff stress. Material response and objectivity. Symmetry group and isotropy. Strain energy function and hyperelastic materials. Constraints and reactive stress. Incompressibility. Neo-Hookean and Mooney-Rivlin materials. Dissipation principle and dissipative stress. Viscoelasticity. Fluids and solids. A general scheme for describing growth and relaxation via Kroner-Lee decomposition. Remodeling forces and stress. Eshelby tensor. Molar balance and diffusion of an atomic species in an elastic crystal. Energy imbalance. Fick's law. Entropy flow and heat diffusion in an elastic material. Entropy production and energy imbalance. Fourier's law. Numerical simulations with Comsol Multiphysics.

*Mathematical Engineering programme*

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