THEORETICAL AND EXPERIMENTAL NON-LINEAR SOLID MECHANICS FOR BIOMEDICAL MATERIALS

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Program:

Kinematic of continuum bodies: configuration and motion of a continuum body, deformation function, lagrangian and eulerian viewpoints, deformation gradient, strain tensors.

Mechanics of continuum bodies: the concept of stress, stress tensors, Reynolds' transport theorem, conservation of mass, momentum balance principles, formulation of the mechanical problem, Clausius-Duhem dissipative inequality.

Constitutive formulations: hyperelasticity, hyperelastic formulations for isotropic and anisotropic materials, procedures for the identification of constitutive parameters.

Case studies in biomechanics: mechanics of stomach tissues and structures, mechanics of the lower urinary tract, mechanics of fascial systems: from microstructure to constitutive modelling.

Laboratory experience: experimental tests on biological tissues and inverse analysis for the evaluation of constitutive parameters.

References:

Gerhard A. Holzapfel, "Nonlinear Solid Mechanics: A Continuum Approach for Engineering". *John Wiley and Sons, LTD*. ISBN: 978-0-471-82319-3

Examination and grading:

A report on a case study: from experimental data to constitutive parameters through the application of the analysed techniques.

Course details:

The course will be offered primarily in-person, with the possibility to switch into online mode if necessary.

The basic course in health and safety: "general training" (4 hours) is required to access in the laboratory of biological tissues.