Course title: Continuum Mechanics	Neptun code: GEMET401-a
Course coordinator: Dr. György Szeidl, DSc, professor emeritus	
type of lesson and number of lessons: **lecture (2)**	
method of evaluation: colloquium	
curriculum location of the subject: (autumn/spring semester): autumn and spring	
pre-study conditions *(if any)*: Familiarity with the fundamental concepts and principles of engineering mechanics, a solid mathematical background in vector algebra and analysis are required for the effective and productive work.	

The task and purpose of the subject:

The main objective of the course is to provide a concise introduction to continuum mechanics. Within the framework of the course, special emphasis is given to the nonlinearity of those equations which describe the deformations. A further aim is to introduce the basic concepts, the relevant principles and the methodology in such a way as to enable students to use commercial finite element programs for solving the nonlinear problems of continuum mechanics.

Course description:

Tensor algebra and the elements of tensor analysis in index notation. Configurations. Material and spatial descriptions. Deformation gradient. Inverse deformation gradient. Deformation tensors and strain tensors in the initial and current configurations. Polar decomposition theorem. Strain measures. Compatibility conditions. Time dependent tensor fields. Material time derivative. Velocity gradient. Additive resolution of the velocity gradient. Spin tensor, rotation tensor. Time derivative of the deformation gradient. Time derivatives of strain tensors. The linear theory of deformation. Compatibility of the linearized strain tensor. External and internal forces. Stress tensors. Boundary conditions. Principle of mass conservation. Equations of motion. Energy theorem. The first- and second law of thermodynamics. Principle of virtual power and work. Principle of complementary virtual power and work. Incremental form of the principle of virtual work in Lagrangian description. Constitutive equations. The linearized theory of continuum mechanics - elastic bodies. Field equations and boundary conditions.

Required literature:

1. György Szeidl and Imre Kozák: Introduction to Continuum Mechanics of Solid Bodies, 2023. (Lecture notes typeset by LaTeX. They are given freely to the students in pdf format.)

Recommended literature:

1. Morton E. Gurtin: An Introduction to Continuum Mechanics, Academic Press, 1981.