

## Chapter:

Podlesnij S., Hrushko O., Kovalenko A. & Stashkevych I. Mechanical tests and properties of living tissues and biomaterials in a biomechanics course.

**Abstract:** For the development of biomechanics, biology, bioengineering, and medicine, including for the purpose of creating substitutes for tissues and organs (implants and prostheses), it is important to know the mechanical properties of living tissues and biomaterials and methods for their determination. This chapter briefly lists the types of living tissues, biomaterials and reviewed their mechanical properties and methods for their determination. Such types of biomaterials as Metallic biomaterials, Ceramics, Polymers as biomaterials, Composites, Nanomaterials and Fabric Engineering are considered.

The main types of deformations that human living tissues undergo are considered, these are stretching-compression, shear, torsion and bending. The basic concepts of normal and shear stress are revealed. Hooke's law is given and the elastic constants of an isotropic material are described – Young's modulus, shear modulus, Poisson's ratio. The classical methods of mechanical testing and determination of mechanical properties are described: tensile and compressive strength, stiffness, stability, hardness. The tensile diagram in the coordinates of deformation-stress is considered and the concepts of characteristics strength are given. The values of the ultimate compressive strength, Young's modulus and Brinell hardness of a number of living tissues of the human body are given. Some questions of tribology of joints are stated, in particular, the concepts of friction in joints, the phenomenon of metallosis and features of tribological tests of endoprotheses are disclosed. Examples of test equipment are provided.

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