

PHYSICS AND BIOMECHANICS OF HUMAN MOVEMENT

[in PHYSICS AND BIOMECHANICS OF HUMAN MOVEMENT]

Course ID: FIS/07

ECTS: 4

1st Year: 1st semester

Teacher: PROF. GUERRISI Maria Giovanna

Objectives: Basic Biomechanics provides background in principles of biomechanics. The course applies and builds on the concepts of Statics and, Dynamics for human activities, and Mechanics of Materials and tissues.

The course provides an overview of the mechanical properties and structural behavior of biological tissues, and biodynamics. Specific course topics will include structure and function relationships in tissues and organs; application of stress and strain analysis to biological tissues; analysis of forces in human function and movement; energy and power in human activity; introduction to modeling viscoelasticity of tissues. Finally, the course will include the beginning stages of a biomechanical design project.

After active participation in this course and an effort to learn the material, students will be able to:

1. Recall the general characteristics, material properties, appropriate constitutive model, and adaptation potential for tissue studied.
2. Identify relationships between structure and function in tissues and the implications/importance of these relationships.
3. Analyze the forces at a skeletal joint for various static and dynamic human activities.
4. Calculate the energy expenditure and power required to perform an activity.
5. Analyze the stresses and strains in biological tissues, given the loading conditions and material properties.
6. Identify the appropriate viscoelasticity model for the mechanical behavior of a given biological tissue.
7. Predict the overall creep and stress relaxation behavior for a basic viscoelastic material model.

Program:

1. Basic Statics and Joint Mechanics (elbow, shoulder, spine, hip, knee, ankle)
2. Basic Dynamics to Human Motion; Review of linear and angular kinematics; Kinetic equations of motion; Work & energy methods; Momentum methods; Examples in biomechanics; Modern kinematic measurement techniques; Applications of human motion analysis
3. Structure, Function, and Adaptation of Major Tissues and Organs: Bones, Cartilage, Ligaments, Tendons, Muscles, Skin, Heart, Artery, Vein, Lung.

4. Fundamental Strength of Materials in Biological Tissues:
5. Introduction to Viscoelasticity and Comprehensive Review

Textbooks

Exam method: