



Syllabus

Term: 2025/26/2

Subject name: Biomechanics

Subject code: ENAEDZN0801

Unit (Unit code) (TESTNEV)

Lecturer responsible for the course: Dr. VÁCZI Márk

Requirement: Exam

Classes per week : 2/0/0

Classes per term: 26/0/0

Purpose of education:

Acquiring two major topics: principles of mechanics, and the neuromechanical basis of muscle, students will understand the background of muscular force production and forces acting on human body during physical activity.

Contents:

Week 1 Definition, development, importance, and application of biomechanics as an interdisciplinary science. Principles of motion.

Week 2 Types of motions from mechanical aspects. Steady and unsteady motions. Straight and curved motions.

Week 3 Definition of mechanics 1. Kinematical and dynamical parameters of motions. Displacement, time, and velocity.

Week 4 Definition of mechanics 2. Velocity and acceleration. Kinematical parameters during rotary motions. Ways to measure kinematical parameters of motions.

Week 5 Definition of free fall. Horizontal, vertical, and oblique trajectory.

Week 6 Principles of dynamics. Force as a vector quantity. Newton's laws and their applications in sport movements.

Week 7 Definition of statics. Balance and stability. The leverage system in the human body.

Week 8 Mechanical work, energy, power, pressure, and friction. Forces acting on human body in fluid.



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Contents:

Week 9 Structure, function, and molecular contraction mechanism of skeletal muscle. The excitation-contraction coupling.

Week 10 Muscle fiber and motor unit types. Motor unit recruitment principles. Electric activity and reflex mechanisms of muscle.

Week 11 Mechanical aspects of skeletal muscle force production. Length-tension, force-velocity, torque, and elastic energy storage characteristics.

Week 12 Skeletal muscle plasticity. Fatigue, microdamage, neural adaptation, hypertrophy, sarcopenia.

Week 13 Laboratory tests in biomechanics. Dynamometry, force plate, EMG, motion analysis.

System of examining and valuation:

Written exam is based on lectures, accessible electronic sources and lecture materials.

Grades:

51% Satisfactory

65% Average

80% Good

90% Excellent

Bibliography:



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Bibliography:

Recommended readings

McGinnis, PM: Biomechanics of Sport and Exercise. Human Kinetics, 2013.

Enoka, RM: Neuromechanical basis of human kinesiology. Human Kinetics, 1994.

Lieber RL. Skeletal Muscle Structure, Function, & Plasticity. Lippincott Williams & Wilkins, 2002.

Bibliography: