PHYSICS APPLIED

[in 8059419 OPTIONAL COURSES]

Course ID: FIS/07

ECTS: 2

1st Year: 2nd semester

Teacher*:* PROF. DUGGENTO Andrea

Objectives: This course is designed to present an integrated, principle based, and problem solving approach to the quantitative analysis of human movement. At the end of the course, the student will be able to: explain and quantify displacement, velocity, acceleration, force, torque, impulse, work, and power as related to segmental and whole body linear and angular movements, understand the physical basis for sport technique and health-related applications.

Program:

Units and physical quantities

- SI Units
- Converting units
- Dimensions and dimensional analysis
- Vectors and scalars
- Addition of vectors-graphical methods
- Subtraction of vectors and multiplication of a vector by a scalar
- Adding vectors by components

Kinematics in Two Dimensions and Vectors

- Displacement
- Average velocity
- Instantaneous velocity
- Acceleration
- Motion at constant acceleration

Dynamics: Newton's Laws of Motion

- Forces
- Newton's First Law of Motion
- Mass
- Center of Mass (CM)
- Newton's Second Law of Motion
- Newton's Third Law of Motion
- Weight-The Force of Gravity; and the Normal Force

- Solving Problems with Newton's Laws: Free-Body Diagrams
- Problems Involving Friction, Inclines

Circular Motion; Gravitation

- Kinematics of Uniform Circular Motion
- Dynamics of Uniform Circular Motion
- Angular Quantities
- Constant Angular Acceleration
- Torque
- Rotational Dynamics; Torque and Rotational Inertia

Work and Energy

- Work Done by a Constant Force
- Work Done by a Varying Force
- Kinetic Energy and the Work-Energy Principle
- Potential Energy
- Conservative and Non-conservative Forces
- Mechanical Energy and its Conservation
- Power

Static Equilibrium and Levers

- • The Conditions for Equilibrium
- • Levers
- Applications to Muscles and Joints
- Elasticity and Fracture
- Elasticity; Stress and Strain
- Work Done by a Muscle
- Fracture in Bones

Textbooks N. Özkaya, M. Nordin, “Fundamentals of Biomechanics: Equilibrium, Motion, and Deformation”, Springer, 2012.

Exam method: project assessment