

ID	3100
Curricular Unit	Biomechanics of Sports Techniques
Regent	António Prieto Veloso
Learning Outcomes	<ol style="list-style-type: none"> 1. To apply the basic principles of classical mechanics in order to improve sports performance and/or to prevent sports injuries. 2. To describe the different mechanical properties of the biological tissues and their relationship with sports performance and/or injury prevention. 3. To identify the different experimental measurement techniques used in biomechanics. 4. To interpret and discuss biomechanical studies and 3D motion capture data collected during the laboratory classes.
Syllabus	<ol style="list-style-type: none"> 1 - The description of linear and angular motion: kinematics. <ol style="list-style-type: none"> a) Linear and angular parameters: position, velocity and acceleration. b) Rigid segments' model in 3D: local coordinate system definition. c) Experimental techniques to measure kinematic parameters: 3D motion analysis. 2 - Explaining the causes of linear and angular motion: kinetics. <ol style="list-style-type: none"> a) Newton's laws for linear and angular motion. b) The movement of the center of mass: impulse-momentum relationship and work-energy principle. d) Joint moments and inverse dynamics. e) Angular work, energy and power: muscle action and energy transfer. 3 - Tissue mechanics and musculoskeletal modeling. <ol style="list-style-type: none"> a) Stress-strain relationship for different tissues. b) Muscle mechanical properties. c) Estimating muscle force and activation: an introduction to musculoskeletal modeling.
Evaluation	<p>To be approved in this course, the student has to score higher than 9.5 points in 20. The assessment can be done in two ways:</p> <ol style="list-style-type: none"> 1. Continuous assessment This assessment requires the student to be present in at least in 2/3 of the laboratorial classes. The final grade includes: (1) a written report (50%); (2) a written test (50%). The minimal score of each test has to be higher than 9.5 points in 20. 2. Final exam The final grade is composed by of the grade of a written exam (70%) and the grade of an oral exam (30%). The minimal score of each exam has to be higher than 9.5 points in 20.

Bibliography

Hay, J.G. (1973) The biomechanics of sports techniques. Englewood Cliffs: Prentice-Hall.

Nigg, B.; Herzog, W. (1995) Biomechanics of the musculo-skeletal system. Chichester: Wiley.