

<b>ID</b>	3506
<b>Curricular Unit</b>	Biomechanics of Sports Techniques
<b>Regent</b>	António Prieto Veloso
<b>Learning Outcomes</b>	<ol style="list-style-type: none"> <li>1. To apply the basic principles of classical mechanics in order to improve sports performance and/or to prevent sports injuries.</li> <li>2. To describe the different mechanical properties of the biological tissues and their relationship with sports performance and/or injury prevention.</li> <li>3. To identify the different experimental measurement techniques used in biomechanics.</li> <li>4. To interpret and discuss biomechanical studies and 3D motion capture data collected during the laboratory classes.</li> </ol>
<b>Syllabus</b>	<ol style="list-style-type: none"> <li>1 - The description of linear and angular motion: kinematics. <ol style="list-style-type: none"> <li>a) Linear and angular parameters: position, velocity and acceleration.</li> <li>b) Rigid segments' model in 3D: local coordinate system definition.</li> <li>c) Experimental techniques to measure kinematic parameters: 3D motion analysis.</li> </ol> </li> <li>2 - Explaining the causes of linear and angular motion: kinetics. <ol style="list-style-type: none"> <li>a) Newton's laws for linear and angular motion.</li> <li>b) The movement of the center of mass: impulse-momentum relationship and work-energy principle.</li> <li>d) Joint moments and inverse dynamics.</li> <li>e) Angular work, energy and power: muscle action and energy transfer.</li> </ol> </li> <li>3 - Tissue mechanics and musculoskeletal modeling. <ol style="list-style-type: none"> <li>a) Stress-strain relationship for different tissues.</li> <li>b) Muscle mechanical properties.</li> <li>c) Estimating muscle force and activation: an introduction to musculoskeletal modeling.</li> </ol> </li> </ol>
<b>Evaluation</b>	<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"> <li>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.</li> <li>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.</li> </ol>

**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.