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| **ID** | 2689 |
| **Curricular Unit** | Biomechanics of Sports Techniques |
| **Regent** | António Prieto Veloso |
| **Learning Outcomes** | 1. To apply the basic principles of classical mechanics in order to improve sports performance and/or to prevent sports injuries.<br>2. To describe the different mechanical properties of the biological tissues and their relationship with sports performance and/or injury prevention.<br>3. To identify the different experimental measurement techniques used in biomechanics.<br>4. To interpret and discuss biomechanical studies and 3D motion capture data collected during the laboratory classes. |
| **Syllabus** | 1 – The description of linear and angular motion: kinematics.<br>a) Linear and angular parameters: position, velocity and acceleration.<br>b) Rigid segments' model in 3D: local coordinate system definition.<br>c) Experimental techniques to measure kinematic parameters: 3D motion analysis.<br>2 – Explaining the causes of linear and angular motion: kinetics.<br>a) Newton's laws for linear and angular motion.<br>b) The movement of the center of mass: impulse-momentum relationship and work-energy principle.<br>d) Joint moments and inverse dynamics.<br>e) Angular work, energy and power: muscle action and energy transfer.<br>3 – Tissue mechanics and musculoskeletal modeling.<br>a) Stress-strain relationship for different tissues.<br>b) Muscle mechanical properties.<br>c) Estimating muscle force and activation: an introduction to musculoskeletal modeling. |
| **Evaluation** | 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:<br>1. Continuous assessment<br>This assessment requires the student to be present in at least in 2/3 of the laboratorial classes.<br>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.<br>2. Final exam<br>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. |

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| **Bibliography** | Hay, J.G. (1973) The biomechanics of sports techniques. Englewood Cliffs: Prentice-Hall.<br>Nigg, B.; Herzog, W. (1995) Biomechanics of the musculo-skeletal system. Chichester: Wiley. |