ISEL
ADEM
Área Departamental de Engenharia Mecânica

Curricular Unit Form (FUC)

Course:	FIRST CYCLE IN MECHANICAL ENGINEERING					
Curricular Unit (UC)	Physics I				Mandatory	**X**
					Optional	
Scientific Area:	Basic Sciences					
Year: 1st	Semester: 1st	ECTS:4,0		Total Hours: 45,0		
Contact Hours:	T: 22,5	TP:18,0	PL:4,5	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
Pedro M F Carvalho da Silva		PhD		Prof. Adjunto		

T- Theoretical ; TP – Theory and practice ; PL – Laboratory ; S – Seminar ; OT –Tutorial ; TT – Total of contact hours

Entry into Force	Semester: Winter	Academic Year: 2013/2014

Objectives of the curricular unit and competences (max. 1000 characters)

The main objective of this course is the acquisition of basic concepts of Mechanics and their applications to simple physical phenomena. The student is expected to develop the capability to apply these concepts.

The concepts should be acquired not only in an abstract way, but also in a more applied form through laboratory work.

The student is expected to be able to write laboratory reports, with a correct treatment of experimental measurements.

Syllabus (max. 1000 characters)

Introduction:

Physical quantities. Systems of units. Dimensional homogeneity. Vectors and vectors representation. Internal and external product.

Particle kinematics:

Position, velocity and acceleration vectors. Trajectory. Straight-line motion. Motion in a plane: normal and tangential acceleration. Circular motion: angular velocity and acceleration. Relative motion.

Rigid body kinematics:

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Translation and rotation about a fixed axis. Plane kinematics of rigid bodies. General motion.

Particle dynamics:

Newton's laws. Applications. Work of a force and kinetic energy. Conservative forces, potential and mechanical energy. Systems of particles. Linear momentum and its conservation. Impulse of a force and applications to collisions. Variable mass systems.

Rigid body dynamics:

Torque or moment of a force. Moment of inertia. Angular momentum. General dynamical equations of rigid bodies. Translation and rotation. Plane motion. Rolling. Energy and work in the plane motion of a rigid body.

Demonstration of the syllabus coherence with curricular unit's objectives (max. 1000 characters)

The chapters of the syllabus correspond to the fundamental concepts referred in the objectives of the curricular unit.

Teaching methodologies (including evaluation) (max. 1000 characters)

Teaching method: Lectures and practical sessions. The practical sessions include the resolutions of problems and laboratory experiments (3 sessions). The laboratory sessions are mandatory. 1 or 2 sessions for revisions before partial exams.

Assessment: Two partial exams during the semester, or a final exam (Theory), and a practical component, which consists of four laboratory experiments and their respective reports (Lab). Final grade: 70% Theory + 30% Lab.

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)

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The exams measure the acquisition of the fundamental concepts. The experiments allow the practical acquisition of these fundamental concepts, as referred in the objectives of the curricular unit.

Main Bibliography (max. 1000 characters)
R. Resnik, D. Halliday, K. Krane, "Física 1", 5ª Edição, LTC, 2003. F.P. Beer, E.R. Johnston, W.E. Clausen. "Mecânica Vectorial para Engenheiros – Dinâmica", 7ª Edição, McGraw-Hill, 2006. J.L. Meriam, L.G. Kraige. "Engineering Mechanics – Dynamics", 4th Edition, SI Version, Wiley, 1998. R.C. Hibbeler, "Engineering Mechanics – Statics and Dynamics", 12th Edition, Prentice Hall, 2009. R.A. Serway & J.W. Jewett, "Princípios de Física: Vol.1 – Mecânica Clássica", Thomson, 2004. P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, "Physics for Scientists and Engineers", Prentice Hall, 1996.