

Curricular Unit Form (FUC)

Course:	FIRST CYCLE IN MECHANICAL ENGINEERING					
Curricular Unit (UC)	Physics II				Mandatory	×
					Optional	
Scientific Area:	Basic sciences					
Year: 1	Semester: 2	ECTS: 5,5		Total Hours: 67,5		
Contact Hours:	T: 45	TP:16,5	PL:6	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
Vitor Manuel Barbas de Oliveira		Ph.D		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 curricular unit is the acquisition of the fundamental concepts of electromagnetism, as well as of the concepts and basic principles of wave phenomena, special relativity and quantum mechanics. The student is expected to develop the ability to apply such concepts in the resolution of Mechanical Engineering problems.

It is intended that these notions are acquired not only in an abstract form, but also in a practical way through laboratorial experimental work, allowing the student to acquire the ability to write reports with a correct treatment of experimental data.

Syllabus (max. 1000 characters)

Electromagnetism: Electric charge. Coulomb's law. Electric field. Gauss' Law. Electric Potential. Capacitors and dielectrics. Currents. Magnetic field and magnetic force. Magnetic field created by na electric current. Faraday's law. Magnetism and matter. Inductamce. Energy in magnetic fields. Maxwell's equations. Electromagnetic waves.

Waves: Travelling waves. Energy and power. Sound waves. Doppler effect. Standing waves. Superposition and interference of waves. Light: reflection and refraction; interference and diffraction.

Special Relativity: The Michelson – Morley experiment. The Einstein postulates. Time dilation and length contraction. Relativistic Doppler shift. The Lorentz transformations. Momentum and energy in special relativity. Beyond special relativity.

Introduction to the Quantum Mechanics: The quantum nature of radiation The wave nature of matter. The quantization of the angular moment and the energy levels. Applications of quantum mechanics in engineering.

FUC:	Pagina 1/2
------	------------

Curricular Unit Form (FUC)

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 (4 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)

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)

P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, "Physics for Scientists and Engineers", Prentice Hall, 2nd Edition, 1996; 3rd Edition, 2005.