Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**					
Curricular Unit (UC)	**Electrical Technology**			Mandatory	**X**	
				Optional		
Scientific Area:	**Energy and Control Systems**					
Year: **1º**	Semester: **2º**	ECTS: **4,0**		Total Hours: **3,0**		
Contact Hours:	T: **22,5**	TP: **22,5**	PL:	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
Nuno Paulo Ferreira Henriques		**Mestre**		**Professor Coordenador**		

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

Entry into Force	Semester: **Winter**	Academic Year: **2010/2011**

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

To provide students with a solid set of basic knowledge in the electrical engineering field, enabling them to obtain an overview of electrical technology, aiming mainly electromechanics, electrical installations and management and automation of electrical systems. It is intended that students know the advantages, limitations and implications of using electrical power. It is also intended that students become familiar with the language and methods of electrical engineering, easying their future interaction with electrical engineers.

Students should acquire basic skills that enable them:

- to recognize and understand electrical and magnetic phenomena;
- to design, understand and calculate DC and AC circuits, with special emphasis on three-phase AC circuits;
- to understand magnetic circuits function;
- to use electrical measuring devices;
- to know the basic principles of electrical machines function.

Syllabus (max. 1000 characters)

Fundamental Principles of Electrical Technology: Fundamental concepts of electrostatics and electromagnetic.

Experimental Laws and Basic Circuits: voltage sources, resistors, coils and capacitors. Ohm's, Joule's and Kirchhoff's laws.

Measurement of Electrical Quantities: Measuring instruments - ammeter, voltmeter, ohmmeter and wattmeter

Sinusoidal Alternating Current: Sinusoidal voltage and current, instant and effective value of sinus quantities. Symbolic representation of sinus quantities, vector diagrams. Impedance. Ohm's, Joule's and Kirchhoff's laws applied to AC circuits. Power in AC circuits. Power factor compensation. Transients. Three phase voltage, star and delta connections, phase-to-neutral and phase-to-phase voltages, balanced and unbalanced 3-phase systems. Power in 3-phase circuits.

Introduction to Electrical Machines: Rotating magnetic fields. Operating principles of transformers, synchronous and asynchronous machines.

Demonstration of the syllabus coherence with curricular unit's objectives (max. 1000 characters)
Each basic skill that should be acquired by students is directly linked with each course main theme. Skills could be acquired by lectures and practical classes assistance and by the execution of a set of pedagogically fundamental activities for continuous evaluation done in the lab, each one related with one course main theme.

Teaching methodologies (including evaluation) (max. 1000 characters)
The course teaching is based on lectures, practical classes and lab work. Students are motivated to take an active approach on search of basic information, on solving practical problems and to prepare the laboratory work. It is also required a proper attitude in the laboratory, in compliance with the safety rules, equipment handling rules and test procedures. In order to successfully complete the course, students must succeed the following tests: – a final examination (60%) allowing to evaluate if the necessary knowledge about course themes was acquired; – a set of pedagogically fundamental activities for continuous evaluation (40%), consisting on a mini-test before every lab session, allowing to evaluate planning and preparing of the lab work, and producing a report describing the tests and their results. The continuous evaluation and final examination are compulsory.

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)
Lectures are oriented to discussion and exposure of the syllabus and practical classes are used for the analysis and resolution of practical problems, allowing students to acquire the expertise needed about electrostatic, electromagnetic and circuits theory and to understand the basic functioning of electrical circuits and devices. The laboratory work, carried out in small groups, enable students to develop skills in the practice of testing electrical circuits and devices, including the simulation of faults and malfunctions. The continuous evaluation depends on the individual mark of the mini-tests and performance along the lab work, taking into account the communications skills – oral while answering questions during the work or written on the report.

Main Bibliography (max. 1000 characters)
– Vítor Meireles, *Circuitos Eléctricos,* Lidel Edições Técnicas, 2009 – Edward Hughes, *Electrical and Electronic Technology*, Pearson – Prentice Hall, 2008 – Milton Gussow, *Eletricidade*, Schaum´s Outline Series, McGraw-Hill, 2004 – Joseph A. Edminister, *Circuitos Elétricos*, Colecção Schaum, McGraw-Hill, 1991 – Robert A. Bartkowiak, *Electric Circuit Analysis*, John Wiley & Sons, 1985 – James W. Nilsson, *Electric Circuits*, Wesley Publishing Company, 4th Edition 1992 – C. K. Alexander & M. N. O. Sadiku, *Fundamentals of Electric Circuits*, McGraw-Hill, 2000 – Guilherme de Almeida, *Sistema Internacional de Unidades (SI),* Plâtano Editora, 1997