

Curricular Unit Form (FUC)

Course:	FIRST CYCLE IN MECHANICAL ENGINEERING					
Curricular Unit (UC)	Welding Techonology				Mandatory	
					Optional	X
Scientific Area:	Mechanical Design, Manufacturing and Industrial Maintenance					
Year: 3º	Semester: 2º	ECTS: 4,0		Total Hours: 3,0		
Contact Hours:	T:	TP: 45,0	PL:	S:	OT:	TT: 45,0
Professor in charge		Academic Degree /Title		Position		
Silvério João Crespo Marques		PhD		Associate Professor		

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

Understand and characterize the main welding processes, including equipments, applications, procedures and specific problems. Understand the behaviour of the different materials during welding – metallurgy and weldability.

Understand the principals of quality control on welding and recognize the related standards and their applications to welded fabrication as a special process.

Syllabus (max. 1000 characters)

I. Analysis of the main variables and industrial applications of the principals welding processes.

1. Oxy-gas welding
2. TIG welding
3. MIG/MAG welding
4. MMA welding
5. Submerged-Arc welding
6. Resistance Welding
7. Other welding processes – laser, Electron Beam; Plasma

II. Materials and their behaviour during welding

1. Iron – carbon Alloys
2. Structure of the welded joint
3. Cracking phenomena in welded joints
4. Heat treatment of base materials and welded joints
5. Plain Carbon and Carbon Manganese steels
6. Fine grained steels
7. Thermomechanically controlled process steels (TMCP-steels)
8. Low alloys steels for cryogenic applications
9. Low alloy creep resistant steels

10. Creep and high temperature resistant steels
11. High-alloyed (stainless) steels
12. Aluminium and aluminium alloys

III. Fabrication and applications

1. Quality control during manufacture
2. Residual stresses and distortion
3. Analysis of welding costs

Robot welding

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

The curricular unit's refer to welding processes and equipments, materials and their behaviour during welding and welding quality, check skills of a mechanical engineering graduate course alumni in the welding construction.

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

One test during the semester, or a final exam (50%) and one practical examination pedagogically fundamental with oral presentation (50%) with a minimum evaluation of 10 val.

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

Apart from the theoretical matters exposition the students are faced, in laboratory, with the main welding processes and their possible robotization. Every time it is possible an intervenient from industry in the welding sector, comes to give a lecture. Interpretation of some welding standards are done.

Evaluation in practical examination, are supported by research work and includes the contact with companies in welding activities.

Main Bibliography (max. 1000 characters)

José F. Oliveira Santos e Luísa Quintino, "Processos de Soldadura", ISQ
 H. Granjon, "Bases Metalúrgicas de Soldadura", ISQ
 "Welding Handbook vol I, III and IV", AWS
 "The procedure Handbook of Arc welding", Lincoln Electric Company.