ISEL
ADEM
Área Departamental de Engenharia Mecânica

Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**					
Curricular Unit (UC)	**Mechanical Engineering Drawing Practices**			Mandatory	**x**	
				Optional		
Scientific Area:	**Mechanical Project, Manufacturing and Industrial Maintenance**					
Year: **2nd**	Semester: 1st	ECTS: 5.0		Total Hours: **4,5**		
Contact Hours:	T:	TP:**67.5**	PL:	S:	OT:	TT: 67.5
Professor in charge		Academic Degree /Title		Position		
João M. C. Travassos		**Doutor**		**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: **2016/2017**

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

Objectives:

Reading and interpretation of mechanical assembly drawings, according to functional considerations;

Execution of complete drawings which apply to functional relationships of parts and assemblies with manufacturing process;

Design and drafting of tools as well as control and fittings of machine components for Process Engineering.

Specific Skills:

To understand and to know how to apply dimensioning and geometrical tolerances principles both to normal and threaded mechanical parts;

To understand and know how to apply the concepts regarding to surface textures;

To understand and know how to apply the concepts regarding to functional dimensioning;

To exhibit skills to read, interpret and execute assembly drafting, so that functionality should be guarantee;

To model parts and execute assembly and definition drafting (2D) with 3D Mechanical Project software

Syllabus (max. 1000 characters)

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TOLERANCES AND FITTINGS BETWEEN MATING COMPONENTS: Tolerance definition (uncertainty); International Tolerance System; Tolerance Standardization: International tolerance grade (IT) and Fundamental Deviation (upper and lower deviation); Standardization of tolerance deviations; Practical use of ISO tables. Standardized fittings: Type of fittings; Fitting Systems; Preferred fittings. Method of indicating dimensional tolerances on drafting.
GEOMETRICAL TOLERANCES: Geometrical tolerances principles; Symbols for tolerances of shape, orientation, position and run-out; Method of indicating geometrical tolerances on drafting.
THREAD TOLERANCES
SURFACE TEXTURES: Generalities; Terminology and surface textures definitions; Practical use of tables and measurement devices (roughness gauges); Use of symbols on drafting.
FUNCTIONAL DIMENSIONING: Functional dimensioning principles; Functional analysis with definition of minimal chain of dimensions; Change of dimensions and distribution of tolerances; Practical application exercises on mechanical assembly machines.
TOLERANCING AND DIMENSIONING OF PRISMATIC AND CONICAL ELEMENTS

PRATICAL WORKING STRUCTURE

1. From an assembly drafting, execution of functional study with definition of minimum chain of dimensions and calculation of dimensioning values with tolerances respecting functional conditions imposed.
2. Complete 3D CAD drafting, consisting on:
   - 2.1. Three-dimensional modelling of all non standardized parts within mechanical assembly components;
   - 2.2. Assembling of the mount, including standard mechanical components;
   - 2.3. Drafting of the assembly, including bill of materials and the indication of materials in accordance with ISO Standards;
   - 2.4. Definition drafting (2D) of all non standardized parts, with indication of functional tolerance dimensions, including fittings, surface texture e geometrical tolerance symbols, so that the functionality of the assembly should be guaranteed.

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

Demonstration of syllabus coherence with curricular unit´s objectives is acknowledge through the evaluation process, totally based on practical examination and practical works, in which the student has to demonstrate, in a practical way, both manually and by means of graphical modulation software, that he has developed the necessary skills and knowledge, in accordance with the learning outcomes to be achieved.

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Teaching methodologies (including evaluation) (max. 1000 characters)
The learning methodology is based upon lectures held in a dedicated Laboratory, both with theoretical and practical components supported by adequate bibliography, with the usage of PowerPoint presentations and of complementary learning material, available in the Moodle platform. In the practical component, students are called to develop and solve practical problems, tutored by teachers, while the usage of Mechanical Project software is performed in an autonomous working regime. The assessment is based upon: A final examination and the execution of three practical drafting, reputed as pedagogically fundamentals. Three pratical works - 60% of final classification Final examination - 40 % of final classification (minimum classification: 10 in 20)

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)
Demonstration of teaching methodologies coherence with curricular unit´s objectives is also acknowledge through the evaluation process, which is totally based on practical examination and practical works, and so it becomes mandatory for students to have a big commitment in working with and searching for Mechanical Engineering norms and also for technical data released by mechanical elements manufacturers, so they may demonstrate that they have developed the necessary skills and knowledge.

Main Bibliography (max. 1000 characters)
Morais, S. (2006) ***Desenho Técnico Básico (Vol. 3)*** – Porto Editora Silva, A. et al (2004) ***Desenho Técnico Moderno*** – LIDEL Chevalier, A. (2004) ***Guide du dessinateur industriel*** – Hachette Technique Clyde, M. (1997) ***Tolerance Design: Handbook for Developing Optimal Specifications***–Prentice H Vieitas, J. e Teixeira, P. (2004) ***Complementos da Disciplina*** – ISEL Travassos, J. (2009), Arquivo da Web, travassos.com, Links, ***Complementos de Projecto*** – ISEL