ISEL

INSTITUTO SUPERIOR DE ENGENHARIA DE LISBOA

ADEM

Área Departamental de Engenharia Mecânica

Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**		
Curricular Unit (UC)	**Computer Aided Design And Manufacturing**	Mandatory	
		Optional	**X**
Scientific Area:	**Mechanical Design, Manufacturing and Industrial Maintenance**		
Year: **3º**	Semester: **1º**	ECTS:**4,0**	Total Hours: **3,0**
Contact Hours:	T:	TP:**45,0** PL:	S: OT: TT:
Professor in charge		Academic Degree /Title	Position
José Manuel Simões		**Mestre**	**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: **2010/2011**

Objectives of the curricular unit and competences (max. 1000 characters)
Development of detailed understanding of the concepts involved in the current management of the Production Process supported by computer and understanding of its terminology, in order to incorporate those concepts into the broader Management Life Cycle Product.

Development of comprehension and implementation of advanced topics of programming and CNC machining, including four and five axes, including the high-speed machining.

Development of detailed understanding of integrated CAD / CAM and manufacturing processes and rapid reverse engineering, and acquisition of their ability to be used within the 3D CAD modelling.

Development of understanding of Cellular Manufacturing Systems and Flexible Manufacturing and their architectures and control interface.

Familiarity with the current state of research known about the emergence of new production paradigms in terms of systems integration, data communication, linked with new management philosophies to improve personal and organizational efficiency. |

Syllabus (max. 1000 characters)
1. PRODUCT ENGINEERING
Key steps in the process of product development. Three-dimensional (3D) computer aided modelling (CAD). Integration between CAD and Computer Aided Engineering (CAE). Technical analysis and in service behaviour evaluated through computer aided simulation.

2. CONCURRENT ENGINEERING
Introduction to the concurrent engineering philosophy. "Design for manufacture" concept. Basis for the implementation of a methodology for selection of manufacturing processes. |

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3. COMPUTERIZED NUMERICAL CONTROL (CNC)

CNC equipment, programming parameters, multi-axis machining and machining at high speed. Programming numerical control (NC): the structure of programs, programming languages, programming manual, simulation programs CN. Programming Computer Aided (CAM): methodology and integrating CAD / CAM, steps in getting the program CN, main programming functions available in commercial systems.

4. Rapid Prototyping (RP)

Fundamentals of PR technology. Major processes available in the market and its characterization. PR technology large areas of application.

5. REVERSE ENGINEERING

Characterization of the process. Equipment associated with the three-dimensional scanning. Integration between the Coordinate Measuring (CMM) equipment and the CAD systems.

6. Computer integrated manufacturing (CIM)

Placement of the CIM concept. Identification and classification of manufacturing systems. Group technology and cellular manufacturing. Planning and control systems. Just In Time (JIT).

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

This course intends to give continuity to the contents of previous courses as Mechanical Technology and Mechanical Design, developing skills namely in the integration of computer applications / software.

With the topics covered in this course, students gain theoretical and technical skills on the integration of design and production processes. At the end of this course students will be able to know the latest design and production tools commonly in use in the industry.

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

1. The components for the assessment in this curricular unity are: i) a compulsory project work (pedagogically fundamental), with a minimum grade of 10, ii) 4 laboratory works related to the components of design and manufacturing, iii) a research project, and iv) a field trip report.

The value of the weighting of each component is: 40 percent, 25 percent, 30 percent, and 5 percent, respectively.

2. To pass the curricular unit, the weighted average of the four components must be equal to or higher than 10.

3. The statements for the project research work are delivered to students during the fourth week of the course.

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

The teaching of the theoretical-practical classes consists on the explanation and discussion of the topics covered in the syllabus and on the resolution of applied problems. Audiovisual techniques and appropriate software are used as a support to the presentation and visualization of the examples given.

The learning begins with the interest stimulated on students about the topics discussed in the classroom. It would be accomplished via practical works (laboratory and research) realized by the students organized in small groups (2/3 persons). The work reports will be later discussed based on comments meanwhile submitted by the teacher, during classes specifically dedicated.

The teaching/learning process is complemented in the Moodle platform where relevant information is made available by the teacher and can be accessed by the students.

Main Bibliography (max. 1000 characters)

[1] Zeid, Ibrahim; "CAD/CAM Theory and Practice", McGraw-Hill, Inc., 1991, ISBN 0-07-072857-7

[2] Creese, Robert C.; "Introduction to Manufacturing Processes and Materials", Marcel Dekker, Inc., New York, Basel, 1999, ISBN 0-8247-9914-3

[3] Kalkjian, Serope; "Manufacturing Engineering and Technology", Edition Addions Wesley, 3ª Edição, ISBN 0-201-84552-0

[4] Relvas, Carlos; "Controlo Numérico Computorizado – Conceitos Fundamentais", Publindústria – Edições Técnicas, 1ª Edição, 2000, ISBN 972-95794-6-6

[5] "Prototipagem Rápida", Protoclick, 2001, ISBN 972-95376-1-5

SOFTWARE
-   SolidWorks Education Edition, 2010 SP3.1, Dassault Systèmes

-   CATIA V5 R20, Dassault Systèmes

-   MasterCam X2 MR2, CNC Software, INC