Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**					
Curricular Unit (UC)	**Mechanical Technology I**				Mandatory	**X**
					Optional	
Scientific Area:	**Manufacturing and Mechanical Design**					
Year: **2º**	Semester: **1º**	ECTS:**5,5**		Total Hours: **4,5**		
Contact Hours:	T: **45,0**	TP:**22,5**	PL:	S:	OT:	TT: **67,5**
Professor in charge		Academic Degree /Title		Position		
Ivo Manuel Ferreira de Bragança		**PhD**		**Professor 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: **2020/2021**

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

This course´s main goal is to deliver to students the knowledge about cutting processes, to enable them to be sensible to the potentialities and limitations of these processes.

This course aims to prepare students to be able to select the most appropriate machining process for the manufacture of a part with a particular shape and mechanical properties, selecting equipment and design parameters, of materials and geometries. It also emphasizes the importance of quality in manufactured parts, as well as other aspects that influence the economical outcome of the processes.

Syllabus (max. 1000 characters)

Introduction to Manufacturing Processes

Classification. Applications. Process Engineering.

Cutting Processes

Water Jet Cutting

Thermal Cutting (Laser, Plasma, and Oxy-fuel Cutting)

Electric Discharge Machining (EDM)

Fundamentals of EDM and WEDM (Wire Electric Discharge Machining). Physical Principle and Phases of the Process. Working Parameters.

Machining (Chip Removal Processes)

Process Fundamentals. Mechanics of Metal Cutting. Orthogonal Cutting. Calculation and Selection of the Processes Variables. Cutting Tools and Fluids. Abrasive Cutting.

Blanking

Description and Characterization of the Process. Force *vs.* Punch Displacement Curves. Forces, Work, and Power Calculation. Reducing Force Techniques. Machines, Tools and Other Equipment. Fine-

Blanking and Shaving.

Introduction to Computer Numeric Control (CNC)

Automation of the machining cycle. Automation of machining devices.

Constructive details of CNC's.

Axis and cutting head operation.

Programming fundamentals.

Metrology

Equipments. Measuring and Verification Techniques.

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

With the topics covered in the subject, the concepts related to process engineering are explained. This subject is intended to consolidate knowledge acquired.
At the end of the semester, students will be able to make decisions about process engineering, based on the program contents and with focus on the interaction in both components academic and technical.
The subject is organized into lectures, theoretical and practical laboratory practice, study visits and seminars. In the lectures, theoretical and practical topics that comprise the program are presented and discussed as well as application problems are offered to students. In the laboratory practical classes, students incorporate engineering process techniques and knowledge. In the study visits it's correlated both academic and actual technical and professional items.

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

The classes will be taught using slides, films and illustrative presentation of diagrams of the processes to be addressed. Exercises will be applied to matters under study.
Machining, blanking and metrology classes will be accompanied by laboratory classes where students can experience some of the processes discussed theoretically. Whenever possible, field trips to industrial facilities that use manufacturing processes, and events which display the use of these technologies, will be planned.

The evaluation of the Theoretical and Theoretical-Practical components occurs independently, as detailed:

Theoretical Component

For approval in this component, the students have to perform an exam obtaining a mark higher than (or equal to) 9.5 values.

Theoretical-Practical Component

Performing a three students-group work. The work must be presented as a written document. The students have to do an oral presentation of this work in a specific class, in which its approval conditions will be presented. The minimum mark required in this work is 10 values, since this is a pedagogically fundamental work/component.

The approval in both components is required for approval at the curricular unit.

The final mark is obtained by the following formula:

Final Mark = (3/5) TC + (2/5) PC

TC - Classification obtained in the theoretical component

PC - Classification obtained in the theoretical-practical component

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

The teaching of theoretical and practical classes is done by exposure of the various syllabus using problem-solving which embody practical examples of the various topics, audio-visual techniques and appropriate software to support the presentation and viewing examples, that are associated to the theoretical-practical component (laboratory), in where is developed the students involvement with technical and scientific equipment, thus giving them a greater dynamism.

It seeks that learning triggers student's motivation encouraged on the topics covered in the subject, being achieved by performing various laboratory work, research and external consulting group, whose evaluation is discussed at the final of the semester.

The orientation of the learning takes place through addition of the support outside the school.

Main Bibliography (max. 1000 characters)

- Rodrigues, Jorge; Martins, Paulo, *Tecnologia Mecânica*, Vol. 1 e 2, Escolar editora, 2005;
- Boothroyd, Geoffrey; *Fundamentals of Metal Machinning and Machine Tools*, McGraw-Hill, 2005;
- Groover, Mikell; "Fundamentals of Modern Manufacturing: Materials, Processes and Systems", Wiley, 2012;
- Davim, J. Paulo; *Princípios da Maquinagem*, 2ª Edição, Almedina, 2008;
- Veiga, Alves; *Tecnologia Mecânica II (Teórica)*, DEM, ISEL, 2007;
- Santos, João; Simões, J. Manuel; *Plano de Fabrico (Prática)*, ADEM, ISEL, 2000.