Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**					
Curricular Unit (UC)	**Elements of Machine Design**			Mandatory	**X**	
				Optional		
Scientific Area:	**Manufacturing and Mechanical Design**					
Year: **3**	Semester:	ECTS:**4,5**		Total Hours: **3,0**		
Contact Hours:	T:	TP:**45,0**	PL:	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
Inês de Carvalho Jerónimo Barbosa		**PhD**		**Professor Adjunto Convidado**		

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)

This discipline is mainly intended to provide the mechanical engineers candidates with the knowledge and ability to design mechanical components and their assemblies. Therefore, simple but logical strategies are introduced in order to improve the students' skills for problems solving involving concept and design activities. Mathematical tools and fundamental concepts of machine element design are provided as well as basic concepts of fracture, fatigue and creep strain mechanisms, and vibration analysis.

Syllabus (max. 1000 characters)

Introduction to Fracture Mechanics.

Fatigue in Mechanical Elements.

Introduction to Creep and Stress Relaxation

Elements of Mechanical Systems: mechanical springs, timing belt transmission, transmission chain, gears, mechanical connections, bearings, shaft material selection.

Introduction to single degree of freedom vibrations.

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

The proposed syllabus is chosen in order to provide candidates to the Mechanical Engineering degree with a specific knowledge related to the comprehension of the functioning and design of the majority of the traditional mechanical components and assemblies. Therefore, initially, students are required to understand the essentials about the main causes of premature failure of those components or assemblies – in Fracture Mechanics, in Fatigue, in Creep and Stress Relaxation, and in Vibration Analysis, followed by the design itself, taking into account the conventional calculations as well as the influence of the above mentioned causes of premature failure.

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

Lectures will be provided on a 3 hour/week basis. After a theoretical presentation of each subject, using Power Point, several practical problems will be presented in order to complement the theoretical concepts, as well as the interactive resolution of typical problems. Students will also have access to the Moodle platform where other examples and solved and non-solved exercises are presented together with all the theoretical topics.

Student assessment is based on a design project (PG) and a final examination (EG). The final grading will be obtained by: FG=0,60*EG+0,40*PG.

It will be required a minimum classification of 8,0 val. on each component of the assessment and a final minimal grade of 9,5 val. for approval in this discipline.

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

The adopted methodology of lecturing and the assessment are adequate to the objectives intended for this discipline since it will be required that students acquire specific knowledge and skills through practical/theoretical lessons, where the majority of the theoretical matters are presented in Power Point, and where the practical ones are taught using both classical examples and the exhibition and explanation of the functioning of the components and assemblies to be studied. Lecturing is then followed by the interactive resolution of exercises in order to complement the theoretical presentations. Students will also be encouraged to access the Moodle platform where other solved and non-solved exercises are provided as well as all the theoretical topics, enabling additional autonomous work.

Regarding assessment methodology, this contemplates a necessary and convenient practical written work (project) about one or more of the studied items, where a design component, including its calculation, has to be included.

Main Bibliography (max. 1000 characters)

Shigley, J.; Mechanical Engineering Design, 5th Edition, McGraw-Hill, 1989.

Branco, C.M., Ferreira, J.M., Costa, J.D., Ribeiro, A.S.; Projecto de Órgãos de Máquinas, 2nd Edition, Fundação Calouste Gulbenkian, 2009.

Castro, P.T., Fernandes, A.A., Branco, C.M.; Fadiga de Estruturas Soldadas, Fundação Calouste Gulbenkian, 1999.

Engineering Mechanics: Dynamics (13th Edition), Russell C. Hibbeler, Prentice-Hall, 2012.
Vector Mechanics for Engineers: Dynamics (10th Edition), Ferdinand Beer, E. Russell Johnston Jr., Phillip Cornwell, McGraw-Hill, 2012.