Curricular Unit Form (FUC)

Course:	**FIRST CYCLE IN MECHANICAL ENGINEERING**					
Curricular Unit (UC)	**Statistics Applied to Engineering**			Mandatory	**x**	
				Optional		
Scientific Area:	**Basic Sciences**					
Year: **2**	Semester: 2	ECTS:5.5		Total Hours: **148**		
Contact Hours:	T:	TP:**67.5**	PL:	S:	OT:	TT:
Professor in charge		Academic Degree /Title		Position		
Alda Carvalho		**PhD**		**Assistent 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: **2016/2017**

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

After the approval of this unity, the student should have the skills to:
1. Apply the techniques of descriptive statistics to analyze a data set and interpret the results.
2. Apply the concept of probability in assessing situations of uncertainty.
3. Identify the theoretical models studied in real situations.
4. Apply the techniques of statistical inference as a tool to support decision making and to critically interpret the results.
5 Identify, plan and implement the appropriate statistical methodology for the analytical and computational resolution of a concrete problem.
6. Analyze and interpret the results with critical sense.

Syllabus (max. 1000 characters)

1. Descriptive statistics and exploratory data analysis.
2. Discrete and continuous random variables. Characterizing functions and parameters.
3. Theoretical discrete and continuous distributions. Central Limit Theorem.
4. Sampling and sampling distributions.
5. Point and interval estimation.
6. Parametric and non-parametric typothesis testing for one or more parameters.
7. Nonparametric goodness-of-fit tests. Chi-square tests for independence/ homogeneity.
8. Correlation and linear regression. Multiple linear regression.

Demonstration of the syllabus coherence with curricular unit's objectives (max. 1000 characters)
The course contents are consistent with the objectives of the course, given that: - Point 1 of the syllabus aims to achieve the objectives of section 1; - Points 2 and 3 of the syllabus intended to give section 2 and 3 of the goals; - The remaining points of the syllabus aim to achieve the objectives of section 4; - The objectives referred to in paragraphs 5 and 6 are implemented throughout all points of the syllabus.

Teaching methodologies (including evaluation) (max. 1000 characters)
Classes are theoretical and theoretical-practical. It is used an expositive methodology for the presentation of theoretical contents, suitably exemplified with exercises in the engineering context. Then the students apply and consolidate the knowledge acquired in solving a set of practical exercises provided by the teacher. In addition to the exercises books are available a set of texts to support of program content. The resolution of exercises associated with the content is implemented computationally with appropriate programs. The assessment comprises two alternative parts, continuous assessment and evaluation exam. Continuous assessment consists of two tests (with a minimum of 8 points) during the lessons period, which can be complemented by the completion of work, individual or group, or evaluation forms, whose influence on the final grade should not exceed 40%. The assessment by examination is made by conducting a global examination (20 points) or partial exam (16 points). In the second option, the exam grade is complemented with the work grade (4 points). For approval, a minimum of 10 points is required.

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)
The teaching methodologies are consistent with the objectives of the course, given that the expository method used to explain the matter, specifically allows achieving all the UC objectives. The exemplification problems within specific engineering, allows students to understand how to apply the material used in in real life situations. Knowledge allows the student to formalize a concrete problem, choose the appropriate methods to implement and provide for their proper application. Lists of exercises provided, by its organization, content and diversity of the difficulty degree, allow students to monitor closely all topics of matter and are the main instrument for individual study. The exercises that constitute them are suited to the development of probabilistic thinking capabilities. In addition to the analytical resolution, the resolution of exercises with the use of appropriate computer programs, allows the student to learn the real way to solve this kind of problems in their professional lives.

Main Bibliography (max. 1000 characters)

1. Dougherty, E.R., Probability and Statistics for the Engineering, Computing, and Physical Sciences, Prentice-Hall, Englewood Cliffs, 1990.
2. Guimarães, R.C. e Cabral, J.S., Estatística, 2ª edição, Verlag Dashöfer Portugal, 2010.
3. Montgomery, D.C., Applied Statistics and Probability for Engineers, 5th edition, Wiley, 2010.
4. Murteira, B. e Ribeiro, C.S., Introdução à Estatística, Escolar Editora, 2010.
5. Gama, S.M. e Pedrosa, A.C., Introdução Computacional à Probabilidade e Estatística, Porto Editora, 2007.
6. Pestana, D.D. e Velosa, S.F., Introdução à Probabilidade e à Estatística – volume I, 4ª edição, Fundação Calouste Gulbenkian, 2010.
7. Reis, E., Melo, P., Andrade, R., Calapez, T., Estatística Aplicada – volume I, 5ª edição, Edições Sílabo, 2007.
8. Reis, E., Melo, P., Andrade, R., Calapez, T., Estatística Aplicada – volume II, 4ª edição, Edições Sílabo, 2001.