UNIVERSIDAD DE CASTILLA - LA MANCHA
GUÍA DOCENTE

1. General information

Course: STATISTICS
Type: BASIC
Degree: 421 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Year: 1
Main language: Spanish
Use of additional languages:
Web site:

Code: 56307
ECTS credits: 6
Academic year: 2023-24
Group(s): 20 21
Duration: C2
Second language: English
English Friendly: Y
Bilingual: N

Lecturer: **VICTOR MANUEL CASERO ALONSO** - Group(s): **20 21**				
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Politécnico/2-A15	MATEMÁTICAS	926052867	victormanuel.casero@uclm.es	Lunes: 9:00-10:15 Martes: 9:00-11:30 Miércoles: 12:45-14:00

Lecturer: **IRENE GARCIA CAMACHA GUTIERREZ** - Group(s): **20**				
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Lecturer: **RAUL RIVILLA BASTANTE** - Group(s): **20 21**				
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2. Pre-Requisites

In order to students achieve the described learning objectives, they must possess knowledge and skills that are supposed acquired from their pre-university education:

- Knowledge: basic mathematical operations (powers, logarithms, fractions), polynomials, matrices, derivation, integration and graphic representation of functions.
- Basic skills in managing computers.

Although there are no formal incompatibilities, for students who access a subject without having acquired the skills of the previous subjects, following the subject will be much more costly and difficult both in terms of time and effort.

3. Justification in the curriculum, relation to other subjects and to the profession

This course provides students with the necessary skills to face and solve the problems that a graduate can find in their work, mainly related to the analysis and treatment of data obtained empirically.

In addition, the concepts developed in this subject will be used later in compulsory subjects such as Electrical, Electronic and Automatic Technology, Manufacturing and Industrial Control Systems, and Manufacturing Technology. Some of these concepts also appear in several elective subjects.

For the Engineer, Statistics will be an essential work tool in his/her daily work. The basic responsibility of an Engineer is to lead the continuous improvement of quality and productivity in all processes that depend on him/her. But to improve processes it is necessary to change them, and these changes, if they are to be rational, can only be the result of data analysis. How to generate data that has relevant information? How to extract, by means of the adequate analysis, said information of the data? The answer to both questions is the object of Statistical Science and as a consequence every Engineer must know it and apply it in his daily work.

4. Degree competences achieved in this course

Course competences

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEB01	Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge of linear algebra; geometry, differential geometry, differential and partial differential equations, numerical methods, numerical algorithms, statistics and optimisation.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
CG04	Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
CT02	Knowledge and application of information and communication technology.
CT03	Ability to communicate correctly in both spoken and written form.

Course learning outcomes

Description

Knowledge of the main approaches for solving by numerical methods, user level implementation of software packages for statistics, data processing, mathematical calculation and visualisation, planning algorithms and programming using a high-level programming language, visualising functions, geometric figures and data, designing experiments, analysing data and interpreting results.

Knowledge and interpretation of the fundamental measures of descriptive statistics, approximate two-dimensional data by regression analysis, the fundamentals of probability, estimating parameters of statistical models, constructing confidence intervals, testing hypotheses and making decisions.

Ability to express oneself correctly orally and in writing and, in particular ability to use the language of mathematics as a way of accurately expressing the quantities and operations that appear in industrial engineering. Acquired habits of working in a team and behaving respectfully.

6. Units / Contents

Unit 1: Descriptive Statistics: fundamentals, correlation and regression
Unit 2: Probability Calculus.
Unit 3: Statistical Inference: point estimation and confidence intervals, parametric and non-parametric hypothesis tests.

ADDITIONAL COMMENTS, REMARKS

Computer labs:

Lab 0: Introduction to the statistical software R and descriptive statistics.
Lab 1: Bivariate data, multivariate and linear regression.
Lab 2: Probability distributions and Central Limit Theorem.
Lab 3: Confidence intervals and hypothesis tests (one sample).
Lab 4: Two samples hypothesis tests.
Lab 5: Non-parametric hypothesis tests and analysis of variance.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CG03	1.2	30	N	-	Presentation of contents to the students.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT03	0.6	15	N	-	Problem solving from a list of available exercises.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02 CT03	0.4	10	Y	N	Using R statistical software for problem solving.
Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT03	0.2	5	Y	Y	Final exam consists of 5 exercises: 1 related with theme 1, 1 related with theme 2, 2 related with theme 3 and a final exercise with theoretical and practical test questions and related with the R software.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02 CT03	3.6	90	N	-	For each hour received of theory, problem solving, labs, etc. Dedicate 1.5 hours (study to assimilate contents, solve exercises to prepare exams...)
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Projects	10.00%	0.00%	Continuous assessment: Mean of the projects elaborated by the students.
Final test	65.00%	75.00%	Continuous assessment: Written exam with theoretical-practical questions. Non-continuous evaluation: In addition to the written exam, the student must submit and defend a paper based on a dataset provided by the teachers.
Assessment of activities done in the computer labs	25.00%	25.00%	Continuous assessment: Average of the evaluation sessions of computer labs. Non-continuous assessment: Computer labs exam, the same day as the final exam.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of

the competences).

Evaluation criteria for the final exam:

Continuous assessment:
Correct approach to solve the questions.
Correct results.
Correct written expression.
Minimum grade to pass the subject: 5 points out of 10.

Non-continuous evaluation:
Correct approach to solve the questions.
Correct results.
Correct written expression.
Minimum grade to pass the subject: 5 points out of 10.

Specifications for the resit/retake exam:

Same as final exam.

Specifications for the second resit / retake exam:

Same as final exam.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90

Global activity

Activities	hours
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
	Total horas: 150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
López Cano, Emilio	Estadística empresarial https://www.lcano.com/b/eee/_book/				2020	
Peña Sánchez de Rivera, Daniel	Regresión y diseño de experimentos	Alianza Editorial		978-84-206-9389-7	2002	Libro de teoría, con ejercicios resueltos
Peña Sánchez de Rivera, Daniel	Fundamentos de estadística	Alianza Editorial		978-84-206-8380-5	2008	Libro de teoría, con ejercicios resueltos
Walpole, Ronald E.	Probabilidad y estadística para ingeniería y ciencias	Pearson Educación		978-970-26-0936-0	2007	Libro de teoría
Montgomery, Douglas C.	Probabilidad y estadística aplicadas a la ingeniería	Limusa Wiley		978-968-18-5915-2	2007	Libro de teoría, con ejercicios resueltos
Arriaza Gómez, Antonio J. et al.	Estadística básica con R y R-Commander http://knuth.uca.es/ebrcmdr	Servicio de Publicaciones de la Universidad de Cádiz		978-84-9828-186-6	2008	Libro de prácticas de ordenador
Devore, Jay L.	Probabilidad y estadística para ingeniería y ciencias	Thomson		970-686-457-1	2005	Libro de teoría
Fernández Guerrero, Mercedes	Manual de estadística para ingenieros	Casa Ruiz Morote		84-934398-2-8	2007	
García Pérez, Alfonso	Ejercicios de estadística aplicada	Universidad Nacional de Educación a Distancia		978-84-362-5547-8	2008	Libro de problemas
Letón Molina, Emilio et al.	Mini-Vídeos de autoformación https://media.uc3m.es/series/5b30126d8f420862d08b47ac					
Novo Sanjurjo, Vicente	Problemas de cálculo de probabilidades y estadística	Sanz y Torres		84-96094-14-6	2003	Libro de problemas
Verzani, John	Using R for introductory statistics	Chapman and Hall/CRC		1-58488-450-9	2005	Libro de prácticas de ordenador
López Cano, Emilio	Análisis de datos con R aplicado a la economía, la empresa y la industria https://www.lcano.com/b/adr/_book/				2019	