

**1. General information****Course:** STATISTICS**Type:** BASIC**Degree:** 418 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING**Center:** 303 - E.DE INGENIERÍA INDUSTRIAL Y AEROSPOACIAL DE TOLEDO**Year:** 1**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56307**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 41**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** ISIDRO HIDALGO ARELLANO - Group(s): 41

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**2. Pre-Requisites**

In order for students to achieve the learning objectives described, they must have knowledge and skills that are supposed to be guaranteed in their training prior to accessing the University:

- Knowledge of basic geometry and trigonometry, basic mathematical operations (powers, logarithms, fractions), polynomials, matrices, differentiation, integration and graphic representation of functions.
- Basic skills in handling instruments: elemental handling of computers.

Although there are no formal incompatibilities, 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**

The Industrial Engineer is the professional who uses the knowledge of the physical, mathematical and statistical sciences, together with the engineering techniques, to develop his professional activity in aspects such as the control, instrumentation and automation of processes and equipment, as well as the design, construction, operation and maintenance of industrial products. This training allows you to successfully participate in the different branches that make up industrial engineering, such as mechanics, electricity, electronics, etc., adapt to changes in technology in these areas and, where appropriate, generate them, responding thus to the needs that arise in the productive and service branches to achieve the well-being of the society to which it is due.

**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.

**5. Objectives or Learning Outcomes****Course learning outcomes****Description**

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.  
 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.

## 6. Units / Contents

**Unit 1: Descriptive Statistics: Fundamentals, Correlation and Regression.**

**Unit 2: Probability**

**Unit 3: Statistical Inference: Point and interval estimation, Parametric and Non-Parametric Hypothesis Tests.**

## ADDITIONAL COMMENTS, REMARKS

Lab practices

- 1.- Introduction to R statistical software and RStudio environment.
- 2.- Descriptive Statistics: Distribution graphs and descriptions with numbers.
- 3.- Normal distribution and correlation.
- 4.- Linear regression.
- 5.- Linear regression and contingency tables.
- 6.- Intervals and significance tests for the mean.
- 7.- Intervals and significance tests for means, standard deviations, proportions and ANOVA.

## 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	CB02 CB03 CB04 CB05 CEB01 CG03	1.2	30	Y	N	Prior to face-to-face classes, the sections of the Teaching Text that will be covered will be indicated. The teacher will explain in class those aspects of the theoretical development of the subject that he deems necessary so that the student can later work autonomously. In some sessions, students will be presented with theoretical cases that they must answer and that will be evaluated.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CB03 CB04 CEB01 CG03 CG04 CT02 CT03	0.6	15	Y	N	In these sessions in the classroom, the teacher will solve some problems in which the theoretical aspects previously exposed are applied. After solving some type problems, the teacher will be available to the students to solve the problems of the Teaching Text. In some sessions, students will be presented with problems that they must answer and that will be evaluated. At the end of each topic, a collection of self-assessment exercises will be proposed, the purpose of which is for the student to be able to self-assess the knowledge acquired and resolve any doubts that may have arisen in the tutorials, which is why they are also a good feedback procedure. Once resolved, they must be delivered to the teacher digitized, through the moodle platform, with the required format and on the predetermined date.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CG04 CT02 CT03	0.4	10	Y	N	The proposed practices will be carried out using a free statistical package: R and the RStudio interface. The use of students' personal computers is recommended. At the end of each practice session, students will be presented with exercises that they must solve and that will be evaluated.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02 CT03	3.6	90	N	-	The student must prepare for each of the two progress tests.
							There will be a first evaluation test (scheduled at the beginning of the course through the coordinator) at

Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02 CT03	0.2	5	Y	N	the end of the second unit. This test has established a minimum grade of 4 out of 10 so that you can average in the final grade of the subject. A final evaluation test will be carried out to evaluate the subject globally. Students who have passed the first evaluation test will be examined only on topic three in this second evaluation test. The rest must take this global final exam.
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	20.00%	20.00%	The student will face individually, during lectures and problems, theoretical questions (cases). The evaluation will be carried out through the moodle/campusvirtual platform. This activity is non-recoverable. The student must solve the problems raised and submit the scanned self-assessment exercises (written by hand) on the indicated date, with the correct format and with a clean and clear presentation. This activity is non-recoverable. The evaluation will be carried out through the moodle/campusvirtual platform. Students who opt for non-continuous assessment must submit to a theoretical-practical questionnaire that assesses this knowledge.
Laboratory sessions	10.00%	10.00%	Each laboratory practice will have associated exercises to be solved through the use of the statistical package. The student must answer questions related to these exercises through the moodle/virtual campus platform during the development of the practice. This activity is non-recoverable. Students who opt for non-continuous assessment must take a practical questionnaire that assesses this knowledge.
Final test	70.00%	70.00%	The student must take two evaluation tests with a weight of 35% each. For students who have not reached the minimum grade of 4 in the first partial test, the final test will have a score of 70%. To average the final grade for the course, students must obtain a minimum grade of 4 in the partial tests. In the non-continuous evaluation, the final test will have a weight of 70%.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

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:

The evaluation criteria of the ordinary call are:

20% Work (T).

10% Laboratory Practices (PL).

35% First Partial Test (1PP).

Those who in 1PP obtain a grade lower than 4 out of 10: 70% Final Test (PF).

Those who in 1PP obtain a mark greater than or equal to 4 out of 10: 35% Second Partial Test (2PP).

If the grades achieved either in 1PP+2PP or in PF are less than or equal to 3.5 out of 10, the Final Grade can never be greater than 4.5 out of 10.

The subject is considered passed by averaging the assigned weights and obtaining a Final Grade greater than or equal to 5 out of 10.

##### Non-continuous evaluation:

The final test corresponding to the non-continuous evaluation will have a weight of 70% for these students, who must also take a second theoretical test (theoretical concepts) and practice (R programming language) that will have a weight of 30%.

These two evaluable activities will be mandatory and the student must obtain a minimum grade of 4 out of 10 in each test.

The subject is considered passes by averaging the assigned weights and obtaining a Final Grade greater than or equal to 5 out of 10.

#### Specifications for the resit/retake exam:

The evaluation criteria of the extraordinary call are:

20% Work (T).

10% Laboratory Practices (PL).

70% Final Test (PF).

If the grade achieved in PF is less than or equal to 3.5 out of 10, the Final Grade can never be greater than 4.5 out of 10.

The subject is considered passed by averaging the assigned weights and obtaining a Final Grade greater than or equal to 5 out of 10.

**Specifications for the second resit / retake exam:**

In this case, the same procedure established for the non-continuous evaluation will be applied.

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
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Formative Assessment [PRESENCIAL][Assessment tests]	5
<b>General comments about the planning:</b> This time distribution is indicative and may be modified if the particular circumstances, arising during the development of the course, so advise.	
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Montgomery, Douglas C.	Probabilidad y estadística aplicadas a la ingeniería	Limusa Wiley,		978-968-18-5915-2	2007	
Walpole, Ronald E.	Probabilidad y estadística para ingeniería y ciencias	Pearson Educación		978-970-26-0936-0	2007	
M. T. González Manteiga y A. Pérez de Vargas	Estadística aplicada una visión instrumental <a href="https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=3189079">https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=3189079</a>	Ediciones Díaz de Santos		9788479789138	2009	
S. M. Ross y T. Valdés Sánchez	Introducción a la estadística <a href="https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=5635443">https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=5635443</a>	Editorial Reverté		9788429151916	2014	
A. J. Arriaza Gómez y otros	Estadística Básica con R y R Commander <a href="http://knuth.uca.es/ebrcmdr">http://knuth.uca.es/ebrcmdr</a>	UCA		978-84-9828-186-6		Libro Libre
C. M. Cuadras	Problemas de probabilidades y estadística	PPU		84-86130-06-9		Signatura Biblioteca: 519.2 CUA
C. Pérez López	Estadística : problemas resueltos y aplicaciones	Pearson educación		84-205-3780-2	2003	Signatura Biblioteca: 519.2 PER
D. Peña	Fundamentos de estadística <a href="http://site.ebrary.com/lib/bibliotecaucm/detail.action?adv.x=1&amp;docID=11028686&amp;f00=all&amp;p00=Estad%C3%ADstica">http://site.ebrary.com/lib/bibliotecaucm/detail.action?adv.x=1&amp;docID=11028686&amp;f00=all&amp;p00=Estad%C3%ADstica</a>	Alianza Editorial		978-84-206-8380-5	2008	Signatura Biblioteca: 519.2 PEÑ TEXTO DOCENTE
D. S. Moore	Estadística aplicada básica <a href="http://site.ebrary.com/lib/bibliotecaucm/docDetail.action?docID=10609557">http://site.ebrary.com/lib/bibliotecaucm/docDetail.action?docID=10609557</a>	Antoni Bosch		978-84-95348-04-3	2009	Signatura Biblioteca: 519.2 MOO
E. Gutiérrez González y O. Vladimirovna Panteleeva	Estadística inferencial para ingeniería y ciencias <a href="http://site.ebrary.com/lib/bibliotecaucm/detail.action?adv.x=1&amp;docID=11379359&amp;f00=all&amp;p00=Estad%C3%ADstica">http://site.ebrary.com/lib/bibliotecaucm/detail.action?adv.x=1&amp;docID=11379359&amp;f00=all&amp;p00=Estad%C3%ADstica</a>	Grupo Editorial Patria		9786077444879	2016	
F.J. Martín Pliego López y otros	Problemas de inferencia estadística	Thomson-Paraninfo		84-9732-355-6	2002	Signatura Biblioteca: 519.2(076) MAR
H. A. Quevedo Urías y B. R. Pérez Salvador	Estadística para ingeniería y ciencias <a href="http://site.ebrary.com/lib/bibliotecaucm/detail.action?docID=11013660">http://site.ebrary.com/lib/bibliotecaucm/detail.action?docID=11013660</a>	Grupo Editorial Patria		9786074389395	2014	
I. Espejo Miranda y otros	Estadística descriptiva y probabilidad: teoría y problemas <a href="http://site.ebrary.com/lib/bibliotecaucm/detail.action?docID=10844601">http://site.ebrary.com/lib/bibliotecaucm/detail.action?docID=10844601</a>	UCA		978-84-9828-467-6	2009	
J.L. Devore	Probabilidad y estadística para ingeniería y ciencias.6ª edición.	Thomson		970-686-457-1	2005	Signatura Biblioteca: 519.2 DEV
M. Febrero Bande y otros	Prácticas de Estadística en R <a href="http://eio.usc.es/pub/pateiro/files/pubdocentepracticaseestadistica.pdf">http://eio.usc.es/pub/pateiro/files/pubdocentepracticaseestadistica.pdf</a>	Universidad Santiago de Compostela		978-84-691-0975-1	2008	
M. H. DeGroot	Probabilidad y estadística	Addison-Wesley Iberoamericana		0-201-64405-3	1988	Signatura Biblioteca: D 10454

R.S. Kenet y S. Zacks	Estadística Industrial Moderna	Thomson	970-686-027-4	2000	Signatura Biblioteca: 519.2 KEN
S. J. Álvarez Contreras	Estadística aplicada	CLAG	84-921847-4-4	2011	Signatura Bibilioteca: 519.2 ALV
W. Mendenhall	Probabilidad y estadística para ingeniería y ciencias	Pretice Hall	968-880-960-8	1997	Signatura Biblioteca: D 519.2(076) MEN
I. Espejo Miranda, F. Fernández Palacín y M.A. López Sánchez	Inferencia estadística: teoría y problemas	Servicio de Publicaciones de la Universidad de Cádiz	9788498285581	2016	
<a href="https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=4626891">https://ebookcentral.proquest.com/lib/bibliotecaucm-ebooks/detail.action?docID=4626891</a>					