UNIVERSIDAD DE CASTILLA - LA MANCHA
GUÍA DOCENTE

1. General information

Course: RELIABILITY AND TOTAL QUALITY TECHNIQUES		**Code:** 56447
Type: ELECTIVE		**ECTS credits:** 6
Degree: 356 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING (CR)		**Academic year:** 2021-22
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL		**Group(s):** 20
Year: 4		**Duration:** C2
Main language: Spanish		**Second language:** English
Use of additional languages:		**English Friendly:** Y
Web site:		**Bilingual:** N

Lecturer: VICTOR MANUEL CASERO ALONSO - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-A15	MATEMÁTICAS	926052867	victormanuel.casero@uclm.es	

2. Pre-Requisites

To achieve the learning objectives described, the students must possess knowledge and skills that are supposed to be guaranteed in their training from previous courses:

- Knowledge of descriptive statistics, probability and parametric and non-parametric inference.
- Basic skills in managing computers.

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 (Statistics).

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, 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
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A04	To be able to transmit information, ideas, problems and solutions to both a specialist and non-specialist audience.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Electrical Engineering.
A14	Knowledge to undertake measurements, calculations, evaluations, appraisals, studies, give expert opinions, reports, work plans and similar tasks.
A15	Ability to work to specifications and comply with obligatory rules and regulations.
A16	Ability to analyse and evaluate the social and environmental impact of technical solutions.
A17	Ability to apply principles and methods of quality control.
A18	To have organization and planning skills used in businesses and other institutions and organizations.
A19	Ability to work in a multilingual and multidisciplinary environment.
G07	Ability to read, understand and produce texts of a technical nature in English that are related to Electrical Engineering. Ability to express oneself orally in English. Ability to work in a multilingual environment
G08	Ability to correctly use operating systems, databases and information programs with an application in engineering
G09	Ability to apply quality approach in production processes and use the appropriate analytical techniques
G10	Ability to design, write, handle, direct and control integrated management systems (deadlines, quality, environmental, prevention, security¿) Ability to analyze and compare suggested alternatives in the allocation and uptake of projects. Ability to synthesise all the information in a project management system, present it and defend it to a third party.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Ability to predict, analyze, evaluate and demonstrate the reliability of electrical energy systems

Use of software to resolve mathematical problems that occur in electrical engineering

6. Units / Contents

Unit 1: Reliability
  Unit 1.1 Reliability basic concepts
  Unit 1.2 Statistal models used in Reliability
  Unit 1.3 System reliability

Unit 2: Total Quality
  Unit 2.1 Quality and Total Quality
  Unit 2.2 Tools for improving Quality
  Unit 2.3 Causes and measures of variability

Unit 3: Design of experiments
  Unit 3.1 ANOVA and design of experiments
  Unit 3.2 Factorial designs 2^k and 2^(k-p)
  Unit 3.3 Respose surface methodology
  Unit 3.4 Design of robust products

Unit 4: Statistical process control
  Unit 4.1 Control charts. Foundations.
  Unit 4.2 Control charts by variables and by attributes.
  Unit 4.3 Sampling plans.

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		0.8	20	Y	N	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises		0.48	12	Y	N	
Computer room practice [ON-SITE]	Practical or hands-on activities		0.8	20	Y	N	
Project or Topic Presentations [ON-SITE]	Self-study		0.2	5	Y	N	
Individual tutoring sessions [ON-SITE]			0	0	N	-	
Final test [ON-SITE]	Assessment tests		0.12	3	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study		3.6	90	N	-	
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
Assessment of activities done in the computer labs	20.00%	20.00%	Average of the computer labs.
Theoretical papers assessment	20.00%	20.00%	Average of the team works.
Final test	60.00%	60.00%	.
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:
    Correction in the approach of the problems.
    Correction of results.
    Correct written expression.

    Minimum grade to pass the subject: 5 points out of 10.
  Non-continuous evaluation:
    Evaluation criteria not defined

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**
Final test [PRESENCIAL][Assessment tests]	3

Unit 1 (de 4): Reliability	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	4
Project or Topic Presentations [PRESENCIAL][Self-study]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	30

Unit 2 (de 4): Total Quality	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Project or Topic Presentations [PRESENCIAL][Self-study]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	10

Unit 3 (de 4): Design of experiments	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	8
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	6
Computer room practice [PRESENCIAL][Practical or hands-on activities]	10
Project or Topic Presentations [PRESENCIAL][Self-study]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	30

Unit 4 (de 4): Statistical process control	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Computer room practice [PRESENCIAL][Practical or hands-on activities]	4
Project or Topic Presentations [PRESENCIAL][Self-study]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	20

Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	12
Computer room practice [PRESENCIAL][Practical or hands-on activities]	20
Project or Topic Presentations [PRESENCIAL][Self-study]	5
Final test [PRESENCIAL][Assessment tests]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Arriaza Gómez, A.J. et al.	Estadística básica con R y R-Commander	Servicio de Publicaciones de la Universidad de		978-84-9828-186-6	2008	
Creus Solé, Antonio	Fiabilidad y seguridad : su aplicación en procesos industria	Marcombo		84-267-1362-9	2005	
Griful, E.	Fiabilidad industrial	UPC		84-8301-734-2	2003	
Ishikawa, Kaoru	Introducción al control de calidad / Kaoru Ishikawa; versión	Diaz de Santos		84-7978-172-6	1994	
Montgomery, Douglas C.	Control estadístico de la calidad	Limusa-Wiley		968-18-6234-1	2004	
Peña, Daniel	Fundamentos de estadística	Alianza Editorial		978-84-206-8380-5	2008	
Peña, Daniel	Regresión y diseño de experimentos	Alianza Editorial		978-84-206-9389-7	2010	
Prat, A. et al.	Métodos estadísticos : control y mejora de la calidad	Edicions UPCc, 2004		84-8301-786-5	2004	
Sols, Alberto	Fiabilidad, mantenibilidad, efectividad: un enfoque sistémic	Universidad Pontificia de Comillas		84-89708-93-2	2000	