



## 1. General information

Course: STATISTICS AND COMPUTATIONAL METHODS

Type: BASIC

Degree: 398 - UNDERGRADUATE DEGREE PROGRAMME IN CHEMISTRY

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 1

Main language: Spanish

Use of additional languages:

Web site: Virtual Campus

Code: 57306

ECTS credits: 6

Academic year: 2020-21

Group(s): 23 20

Duration: C2

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: ELENA GAJATE PANIAGUA - Group(s): 20				
Building/Office	Department	Phone number	Email	Office hours
340 Margarita Salas	MATEMÁTICAS		Elena.Gajate@uclm.es	
Lecturer: HELIA DA CONCEICAO PEREIRA SERRANO - Group(s): 23 20				
Building/Office	Department	Phone number	Email	Office hours
Margarita Salas/Despacho 327	MATEMÁTICAS	926052237	heliac.pereira@uclm.es	Send an email to make an appointment.

## 2. Pre-Requisites

To achieve the learning objectives of the subject is required basic knowledge and skills in elementary mathematical operations (powers, logarithms, exponentials, fractions, ...), basic knowledge of derivation and integration of real functions of a real variable, and fun

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

In any branch of Chemistry, Statistics is an essential tool for data organization, data analysis and interpretation of results in any chemical, academic and professional experimental activity. Likewise, the mathematical concepts studied in the subject of Statistics provid

## 4. Degree competences achieved in this course

Course competences	
Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
E17	Develop the ability to relate to each other the different specialties of Chemistry, as well as this one with other disciplines (interdisciplinary character)
G01	Know the principles and theories of Chemistry, as well as the methodologies and applications characteristic of analytical chemistry, physical chemistry, inorganic chemistry and organic chemistry, understanding the physical and mathematical bases that require
T02	Domain of Information and Communication Technologies (ICT)
T03	Proper oral and written communication
T05	Organization and planning capacity
T07	Ability to work as a team and, where appropriate, exercise leadership functions, fostering the entrepreneurial character
T08	Skills in interpersonal relationships

## 5. Objectives or Learning Outcomes

Course learning outcomes	
Description	
Know the main approaches for the resolution of numerical methods, use at the user level some software packages for statistics, data processing, mathematical calculation and visualization, program using a high-level programming language, visualize functions and data, design experiments, analyze data and interpret results.	
Know and know how to calculate the fundamental parameters of descriptive statistics, approximate two-dimensional data through adjustments to functions, recognize different random variables and manage their tables, estimate statistical parameters, test hypotheses and make decisions.	
Get used to teamwork, express yourself orally and in writing, and behave respectfully.	
Additional outcomes	

## 6. Units / Contents

<b>Unit 1: Unidimensional descriptive statistics</b>
Unit 1.1 Frequency distributions
Unit 1.2 Graphic representation
Unit 1.3 Measures of central tendency
Unit 1.4 Measures of variation
Unit 1.5 Introduction to the software R
<b>Unit 2: Bidimensional descriptive statistics</b>
Unit 2.1 Joint variable distribution
Unit 2.2 Simple linear regression
Unit 2.3 Correlation and simple regression analysis
Unit 2.4 ANOVA - Analysis of Variance
Unit 2.5 Nonlinear regression models
Unit 2.6 Applications with R
<b>Unit 3: Introduction to Probability</b>
Unit 3.1 Events. Sample space. Probability of an event.
Unit 3.2 Conditional probability and independence
Unit 3.3 Bayes' Theorem
<b>Unit 4: Random variables and probability distributions</b>
Unit 4.1 Notion of random variable
Unit 4.2 Functions of Random Variables
Unit 4.3 Mean and variance of a random variable. Chebyshev's theorem
Unit 4.4 Discrete probability distributions
Unit 4.5 Continuous probability distributions
<b>Unit 5: Confidence Intervals</b>
Unit 5.1 Mean and variance of a sample
Unit 5.2 Different estimating errors
Unit 5.3 One sample estimating confidence intervals
Unit 5.4 Two sample estimating confidence intervals
Unit 5.5 Applications with R
<b>Unit 6: Hypothesis Testing</b>
Unit 6.1 Testing a statistical hypothesis
Unit 6.2 Unilateral and bilateral hypothesis testing
Unit 6.3 Hypothesis testing for one population
Unit 6.4 Hypothesis testing for two populations
Unit 6.5 Nonparametric hypothesis testing
Unit 6.6 Applications with R
<b>Unit 7: Advanced analysis of variance techniques</b>
Unit 7.1 One way analysis of variance
Unit 7.2 Two-factor analysis of variance
Unit 7.3 Applications with R

## 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	CB01 E17 G01 T02 T03 T05 T07 T08	1.16	29	N	-	
Problem solving and/or case studies [ON-SITE]	Guided or supervised work	CB01 E17 G01 T02 T03 T05 T07 T08	0.56	14	N	-	
Computer room practice [ON-SITE]	Practical or hands-on activities	CB01 E17 G01 T02 T03 T05 T07 T08	0.32	8	Y	Y	
Project or Topic Presentations [ON-SITE]	Group Work	CB01 E17 G01 T02 T03 T05 T07 T08	0.04	1	Y	Y	
Progress test [ON-SITE]	Assessment tests	CB01 E17 G01 T02 T03 T05 T07 T08	0.04	1	Y	N	
Progress test [ON-SITE]	Assessment tests	CB01 E17 G01 T02 T03 T05 T07 T08	0.16	4	Y	Y	
Final test [ON-SITE]	Assessment tests	CB01 E17 G01 T02 T03 T05 T07 T08	0.12	3	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 E17 G01 T02 T03 T05 T07 T08	3.6	90	N	-	
Total:			6	150			
Total credits of in-class work: 2.4							Total class time hours: 60

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	70.00%	80.00%	
Projects	10.00%	10.00%	
Progress Tests	10.00%	0.00%	
Assessment of activities done in the computer labs	10.00%	10.00%	
<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).

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
<b>Hours</b>	<b>hours</b>
Project or Topic Presentations [PRESENCIAL][Group Work]	1
Progress test [PRESENCIAL][Assessment tests]	1
Progress test [PRESENCIAL][Assessment tests]	4
Final test [PRESENCIAL][Assessment tests]	3
<b>Unit 1 (de 7): Unidimensional descriptive statistics</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	8
<b>Unit 2 (de 7): Bidimensional descriptive statistics</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
<b>Unit 3 (de 7): Introduction to Probability</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	14
<b>Unit 4 (de 7): Random variables and probability distributions</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	16
<b>Unit 5 (de 7): Confidence Intervals</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
<b>Unit 6 (de 7): Hypothesis Testing</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
<b>Unit 7 (de 7): Advanced analysis of variance techniques</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	12
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Progress test [PRESENCIAL][Assessment tests]	4
Final test [PRESENCIAL][Assessment tests]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (theory) [PRESENCIAL][Lectures]	29
Problem solving and/or case studies [PRESENCIAL][Guided or supervised work]	14
Computer room practice [PRESENCIAL][Practical or hands-on activities]	8
Project or Topic Presentations [PRESENCIAL][Group Work]	1
Progress test [PRESENCIAL][Assessment tests]	1
<b>Total horas: 150</b>	

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Cítv	ISBN	Year	Description
Canavos, George C.	Probabilidad y estadística : aplicaciones y métodos	McGraw-Hill		968-451-856-0	1988	Libro de teoría con diversos problemas resueltos.
Devore, Jay L.	Probabilidad y estadística para ingeniería y ciencias	Cengage Learning		978-607-481-619-8	2012	
Horra Navarro, Julián de la	Estadística aplicada	Díaz de Santos		978-84-7978-554-3	2009	Libro de teoría con diversos problemas resueltos.
López Fidalgo, Jesús	El azar no existe /	Electolibris,		978-84-943060-1-3	2015	
Mendenhall, William	Estadística matemática con aplicaciones	Grupo Editorial Iberoamérica		968-7270-17-9	1986	Libro con diversas aplicaciones y problemas resueltos.
Miller, J. C.	Estadística para química analítica	Addison-Wesley Iberoamericana		0-201-60140-0	1993	Libro de aplicación de la Estadística a la Química con diversos problemas resueltos.
	http://www.r-project.org					Página web donde se puede descargar gratuitamente el software libro R así como documentación sobre su manejo.
Mansfield, Edwin	Statistics for business and economics: problems, exercises,	W. W. Norton & Company		0-393-95571-0	1987	
Larsen, Richard J.	An introduction to Mathematical Statistics and Its Applcati	Prentice-Hall		0-13-487174-X	1986	
Ross, Sheldon M.	A first course in probability	Prentice-Hall		0-13-896523-4	1998	
Mendenhall, William	Introduction to probability and statiscs	PWS-KENT		0-534-98264-6	1991	