UNIVERSIDAD DE CASTILLA - LA MANCHA
GUÍA DOCENTE

1. General information

Course: MATHEMATICS
Type: BASIC
Degree: 383 - UNDERGRADUATE DEGREE PROGRAMME IN FOOD SCIENCE AND TECHNOLOGY
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Year: 1
Main language: Spanish
Use of additional languages:
Web site:

Code: 58301
ECTS credits: 9
Academic year: 2022-23
Group(s): 22 24
Duration: AN
Second language: English
English Friendly: Y
Bilingual: N

Lecturer: **FRANCISCO PLA MARTOS** - Group(s): **22**

Building/Office	Department	Phone number	Email	Office hours
Margarita Salas	MATEMÁTICAS	3468	francisco.pla@uclm.es	contact by e-mail with the teacher

2. Pre-Requisites

To achieve the learning objectives of the subject, knowledge and skills that are supposed to be guaranteed in the training prior to accessing the University are required. In particular, basic knowledge of geometry, algebra and trigonometry, elementary mathematical operations (powers, logarithms, exponentials, fractions ...), basic knowledge of derivation and integration of real functions of real variables and fundamentals of graphical representation of functions are necessary.

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

As in all scientific disciplines, in Food Science and Technology, Mathematics and Statistics are a basic tool. Mathematics is present in the approach and development of all experimental, academic and professional activities in Food Science and Technology.

The mathematical concepts studied in the subject of Mathematics and Statistics provide an essential tool and constitute a precise language that is later used by most of the basic subjects and other subjects.

Another important aspect of the subject of Mathematics and Statistics is that it is a subject that helps to enhance the capacity for abstraction, rigor, analysis and synthesis that are characteristic of mathematics and necessary for any other scientific discipline.

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.
E01	To acquire basic knowledge in chemistry, mathematics, physics to allow the study of the nature of foods, causes of their alteration and fundamentals of their production processes
G02	To possess a correct oral and written communication. To transmit information, ideas, problems and solutions to a both specialized and not specialized public.
G04	To develop the necessary skills of learning to undertake later studies with a high degree of autonomy.
G06	To dominate the Technologies of the Information and the Communication (TIC) to user's level, which allows to work in virtual spaces, Internet, electronic databases, as well as with common software packages (e.g. Microsoft Office).
G08	To know the principles and the theories of Basic Science as well as the methodologies and applications of the chemistry, physics, biology and mathematics that are necessary to acquire the specific knowledge of the Degree.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the theory about matrices and know how to implement the corresponding calculations

To know derivate, integrate and plot one and several variables functions, as well as the meaning of the derivate and the integral

To know how to approximate functions and data by means of developments in power and Fourier series

To know how to model food technology processes through differential equations, solve them and interpret results

To know how to use the language of Mathematics

To know how to calculate the principal paramenters of the descriptive statistic

Additional outcomes

To know the main approaches to solving using numerical methods and use some statistical software packages at the user level.

To get used to teamwork, express oneself orally and in writing, and behave respectfully.

6. Units / Contents

Unit 1: Algebra fundamentals

    Unit 1.1 Matrices and determinants

Unit 1.2 Linear equations systems

Unit 1.3 Operations with matrices and determinants and solution of systems of linear equations with Matlab

Unit 2: Differential and integral calculation of one variable

Unit 2.1 Limits and continuity

Unit 2.2 Derivatives

Unit 2.3 Taylor polynomial. Functional approximation

Unit 2.4 Optimization. Growth. Extremes. Convexity

Unit 2.5 Indefinite and definite integrals

Unit 2.6 Improper integrals

Unit 2.7 Graphical representation, derivation, integration and approximation of functions with Matlab

Unit 3: Differential and integral calculation of several variables

Unit 3.1 Multi-variable functions

Unit 3.2 Limits and continuity

Unit 3.3 Partial derivatives. Gradient

Unit 3.4 Optimization. Extremes. Second derivatives criterion

Unit 3.5 Introduction to double integrals

Unit 3.6 Graphical representation, differentiation, integration and optimization in several variables with Matlab

Unit 4: Introduction to differential equations

Unit 4.1 Exact solution of first-order ordinary differential equations

Unit 5: One-dimensional descriptive statistics

Unit 5.1 Frequency distribution

Unit 5.2 Graphic representations

Unit 5.3 Measures of centralization and dispersion

Unit 5.4 Practice with computer. Introduction to scientific statistical software R

Unit 6: Two-dimensional descriptive statistics

Unit 6.1 Distribution and joint representation of two variables

Unit 6.2 Relation between quantitative variables

Unit 6.3 Linear regression and prediction

Unit 6.4 Regression models and regression ANOVA table

Unit 6.5 Practice with a computer. Scientific and technological applications with R

Unit 7: Introduction to probability

Unit 7.1 Experiments and random events. Definitions

Unit 7.2 Conditional probability and independence of events

Unit 7.3 Fundamental theorems of probability

Unit 8: Random variables and probability distributions

Unit 8.1 Definitions

Unit 8.2 Probability and distribution functions of a random variable

Unit 8.3 Some discrete and continuous random variable distributions

Unit 9: Inference. Estimation and hypothesis contrast

Unit 9.1 Sampling. Point estimation

Unit 9.2 Confidence interval estimation

Unit 9.3 Parametric tests for one and two samples

Unit 9.4 Practice with computer. Introduction to scientific statistical software R

Unit 10: Introduction to Experiment Design and Quality Control

Unit 10.1 1-factor ANOVA

Unit 10.2 Introduction to quality control

Unit 10.3 Practice with computer. Introduction to scientific statistical software 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 E01 G02 G04 G06 G08	1.9	47.5	Y	N	Face-to-face teaching, teaching theoretical classes and solving exercises.
Workshops or seminars [ON-SITE]	Problem solving and exercises	CB01 E01 G02 G04 G06 G08	0.9	22.5	Y	Y	Tutorized work of solving problems in class.
Computer room practice [ON-SITE]	Practical or hands-on activities	CB01 E01 G02 G04 G06	0.4	10	Y	Y	Tutored problem solving work using computational techniques in class. The objective of these practices is for the student to carry out a Matlab exercise and prepare a statistical work outside of class using R.
Problem solving and/or case studies [ON-SITE]	Group tutoring sessions	CB01 E01 G02 G04 G06	0.1	2.5	Y	Y	It will consist of doing exercises in class and consulting doubts for an hour in class. Work done in class will be taken into account.
Mid-term test [ON-SITE]	Assessment tests	E01 G02 G04 G06	0.16	4	Y	Y	There is a two-hour Part I midterm exam during the course and a second two-hour Part II midterm exam in the final exam. These partials consist of solving a series of proposed exercises related to each

							part. Part I: Algebra, Calculus and Equations. Part II: Statistics. Part I: Algebra, Calculus and Equations. Part II: Statistics.
Final test [ON-SITE]	Assessment tests	E01 G02 G04 G06	0.14	3.5	Y	N	A final exam with all the subject (or only the partial of Part II if the first one was passed) consisting of the resolution of a series of exercises of the entire syllabus (or of the part not passed).
Study and Exam Preparation [OFF-SITE]	Self-study	E01 G02 G04 G06 G08	5.4	135	N	-	Individual study and preparation of evaluation tests.
		Total:	**9**	**225**			
Total credits of in-class work: 3.6					**Total class time hours: 90**		
Total credits of out of class work: 5.4					**Total hours of out of class work: 135**		

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	15.00%	15.00%	- In the case of continuous evaluation: a team work of the Statistics part will be presented, also using the free statistical software, R. - In the case of Non-Continuous evaluation: an individual work of the Statistics part will be presented using R. Is evaluated: Presentation of the work and correction of the solution and resolution method.
Progress Tests	15.00%	15.00%	- In the case of Continuous evaluation: Troubleshooting and practical cases and exercise with the Matlab program. - In the case of Non-Continuous evaluation: the problems of the progress test and the Matlab exercise will be included in the final exam of the ordinary call. Is evaluated: 1. Correction of the problem statement. 2. Correction of the solution. 3. Correction of written expression. Concept errors and errors in basic mathematical operations will imply penalties.
Test	70.00%	70.00%	- Continuous assessment: Partial/final exams. Is evaluated: 1. Correction of the problem statement. 2. Correction of the solution. 3. Correction of written expression. Concept errors and errors in basic mathematical operations will imply penalties. The partial passed during the course will mean the release of the corresponding part for the final exam. - Non-Continuous Evaluation: Final exam. Is evaluated: 1. Correction of the problem statement. 2. Correction of the solution. 3. Correction of written expression. Concept errors and errors in basic mathematical operations will imply penalties.
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:

1. An exam is carried out with all the subject for students who have not passed the first part.
The final grade of these students will be: 70% of the final exam grade + 15% of the progress tests and the Matlab exercise + 15% of the grade of the work in which the R statistical software has been used.
2. A partial exam of Part II is given to students who have passed part of Part I.
The final mark of these students will be: 70% of the average mark of the partial exams + 15% of the progress tests and the Matlab exercise + 15% of the mark of the work in which the statistical software R has been used.

To pass the subject, it will be required that the final average grade, taking into account the description 70%+15%+15%, must be equal to or greater than 5/10.

Examination evaluation criteria:
1. Correction of the problem statement.
2. Correction of the solution.
3. Correction of written expression.

Concept errors and errors in basic mathematical operations will imply penalties.

Non-continuous evaluation:

The student has to indicate at the beginning of the course if he wants the non-continuous evaluation and it has to be justified

There is a final exam with all the material and a computer practice exam.

The final mark of these students will be: 85% of the mark of the final exam in which a Matlab exercise and progress test will be carried out + 15% of the individual work using R.

To pass the subject, it will be required that the final average grade, taking into account the description 90% + 10%, must be equal to or greater than 5/10.

Examination evaluation criteria:
1. Correction of the problem statement.
2. Correction of the solution.
3. Correction of written expression.
Concept errors and errors in basic mathematical operations will imply penalties.

Specifications for the resit/retake exam:
1. An exam is carried out with all the subject for students who have not passed any part of the subject in the ordinary call.
The final mark of these students will be: 85% of the final exam mark + 15% of the work mark using R.
2. A partial exam is carried out for students who have not passed said partial exam in the ordinary call.
The final mark of these students will be: 85% of the average mark of the partial exams + 15% of the work using R.

To pass the subject, it will be required that the final average grade, taking into account the description 85% + 15%, must be equal to or greater than 5/10.

Examination evaluation criteria:
1. Correction of the problem statement.
2. Correction of the solution.
3. Correction of written expression.
Concept errors and errors in basic mathematical operations will imply penalties.

Specifications for the second resit / retake exam:
A final exam is carried out with all the subject for students who have not passed the ordinary exam.
The final mark of these students will be: 85% of the final exam mark + 15% of the work mark using R.

To pass the subject, it will be required that the final average grade, taking into account the description 85% + 15%, must be equal to or greater than 5/10.

Examination evaluation criteria:
1. Correction of the problem statement.
2. Correction of the solution.
3. Correction of written expression.
Concept errors and errors in basic mathematical operations will imply penalties.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Mid-term test [PRESENCIAL][Assessment tests]	4
Final test [PRESENCIAL][Assessment tests]	3

Unit 1 (de 10): Algebra fundamentals	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	12

Unit 2 (de 10): Differential and integral calculation of one variable	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	12

Unit 3 (de 10): Differential and integral calculation of several variables	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	9
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Problem solving and/or case studies [PRESENCIAL][Group tutoring sessions]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	17

Unit 4 (de 10): Introduction to differential equations	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	10

Unit 5 (de 10): One-dimensional descriptive statistics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	12

Unit 6 (de 10): Two-dimensional descriptive statistics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	14

Unit 7 (de 10): Introduction to probability	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	13

Unit 8 (de 10): Random variables and probability distributions	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	3
Problem solving and/or case studies [PRESENCIAL][Group tutoring sessions]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	15

Unit 9 (de 10): Inference. Estimation and hypothesis contrast	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	3
Computer room practice [PRESENCIAL][Practical or hands-on activities]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	22

Unit 10 (de 10): Introduction to Experiment Design and Quality Control	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	8

Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	47
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	25
Computer room practice [PRESENCIAL][Practical or hands-on activities]	9
Problem solving and/or case studies [PRESENCIAL][Group tutoring sessions]	2
Mid-term test [PRESENCIAL][Assessment tests]	4
Final test [PRESENCIAL][Assessment tests]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	135
Total horas:	**225**

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
García, A. y otros	Cálculo I y II	CLAGSA	Madrid		1994	Libro completo: teoría, problemas resueltos, propuestos y aplicaciones. Con esquemas teóricos.
C.Canavos, George	Probabilidad y Estadística. Aplicaciones y Métodos	MC Graw Hill				Libro de teoría y problemas con aplicaciones. Gran variedad de ejemplos y de ejercicios resueltos muy bien explicados
Camacho Rosales, Juan	Estadística con SPSS para Windows. Versión 11	Ra-Ma			2002	Libro práctico de SPSS: comandos, ejemplos y ejercicios, aplicaciones. Muy buena descripción de los comandos. Se pueden mirar versiones posteriores de SPSS
García J.	Álgebra lineal: sus aplicaciones en Economía, Ingeniería y otras Ciencias	Delta Publicaciones			2006	Libro completo: con teoría, problemas resueltos, problemas propuestos y aplicaciones
Herrero, Henar	Informática aplicada a las ciencias y a la ingeniería con Ma	E. T. S. Ingenieros Industriales Librería-Pap	Ciudad Real	84-699-3109-1	2009	Es un manual de MATLAB muy pedagógico con múltiples ejemplos aplicados
Horra Navarro, Julián de la	Estadística aplicada	Díaz de Santos	Madrid	84-7978-225-0	1995	Estadística aplicada básica. Libro completo: con

Lay, David C.	Algebra lineal y sus aplicaciones	Pearson		978-970-26-0906-3	2007	teoría, problemas resueltos, problemas propuestos y aplicaciones
Profesorado del Grado en Ciencia y Tecnología de los Alimentos	Actividades Prácticas del Grado en Ciencia y Tecnología de los Alimentos	Ciudad Real	978-84-939630-5-7	2014	Actividades prácticas del Grado en Ciencia y Tecnología de los Alimentos que están desarrolladas por cursos y asignaturas. La asignatura de Matemáticas y Estadística está en el capítulo 2: Prácticas 1º, páginas 67-128 y autores Hélia Pereira y Francisco Pla. En este capítulo se describe las prácticas de la asignatura de Matemáticas y Estadística usando Matlab y SPSS y descripciones teóricas de los resultados.
Zill, Dennis G.	Ecuaciones diferenciales con aplicaciones	Iberoamérica	968-7270-45-4	1988	Libro completo: con teoría, problemas resueltos, problemas propuestos y aplicaciones
	http://www.gnu.org/software/octave/					Página web donde se encuentran los programas y documentación del software libre octave.
	http://www.gnu.org/software/octave/					
	http://www.r-project.org/					Página web donde se encuentran los programas y documentación del software libre R
	http://www.r-project.org/					