Teaching Guide				
Identifying Data				2023/24
Subject (*)	Simulation of Industrial Processes and Optimization		Code	730G04074
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Empresa			
Coordinador	Pernas Álvarez, Javier	E-mail	javier.pernas2@udc.es	
Lecturers	Lamas Rodriguez, Adolfo Pernas Álvarez, Javier	E-mail	adolfo.lamasr@udc.es javier.pernas2@udc.es	
Web				
General description	In this subject you learn to design, model, characterize and optimize production and logistics processes in order to have a digital twin of the process.			

Study programme competences / results	
Code	Study programme competences / results
B5	CB5 Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B7	B5 Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
B9	B8 Adquirir unha formación metodolóxica que garanta o desenvolvemento de proxectos de investigación (de carácter cuantitativo e/ou cualitativo) cunha finalidade estratéxica e que contribúan a situarnos na vangarda do coñecemento

Learning outcomes			
Learning outcomes	Study programme competences / results		
Know how to formulate and solve situation problems where there is randomness.		B5 B7 B9	
Ability to abstract, understand and analyze processes.		B5 B7 B9	
Know how to use simulation software. Solve problems of complex industrial processes.		B5 B7 B9	

Contents	
Topic	Sub-topic
The following topics develop the contents established in the tab of the Verification Memory that are:	Simulation. Modeling and simulation. Discrete Event Simulation. Concepts used in simulation of discrete events. Advanced simulation techniques.
Discrete Event Simulation: concepts.	Introduction. Simulation applications. Systems, models and simulation. Types of simulation. The modeling process. Systems and processes of discrete events. Terminology and architecture of a discrete event model. Application areas.

2. Flexsim 3D: bases.	Sources. Queues Processors Sinks. Practical case. Tags, decisions, popups. Practical case Libraries of standard objects I: Combiner. Separator. Multiprocessor. Rack. Conveyor. Practical case. Libraries of standard objects II: Task Executer. Operator. Transporter. Elevetor. Robot. Crane. ASRSvehicle. Practical case.
3. Analysis of input data for simulation and time measurement.	Practical case.
4. Simulation: experiments and analysis of results.	Practical case.
5. FlexSim: Tables, variables, connection with Excel.	Global tables. Labels Global variables. Monitoring variables. Connection with Excel. Modification of variables. Case study.
6. Advanced simulation techniques.	Introduction to Process Flow.
7. Optimization.	Linear programming. Non-Linear Programming Metaheuristics.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	B5 B7 B9	30	30	60
Problem solving	B5 B7 B9	10	20	30
ICT practicals	B5 B7 B9	20	38	58
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Lectures about the course topics.
Problem solving	Solving simulation and optimization problems encountered in engineering.
ICT practicals	Resolution of practical cases of simulation and optimization problems.

Personalized attention	
Methodologies	Description
ICT practicals Guest lecture / keynote speech Problem solving	The personalized attention will be made in the tutorials.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
ICT practicals	B5 B7 B9	La evaluación se hará en base a los trabajos realizados en las clases prácticas en clase así como los trabajos individuales en casa. Todos ellos se subirán a la plataforma Moodle.	100

Assessment comments

Assessment Criteria Second Opportunity and Early Call For both first and second opportunity students, the evaluation will be conducted according to the relative weight indicated in the methodologies table, the same as for students in the early call.In order to pass the course, both in the first and second evaluation opportunities, as well as in the early call, it will be necessary to obtain a grade equal to or higher than 5 out of 10 in the ICT practicals. No grade Students who do not submit the ICT practicals within the given deadlines, as indicated by the respective professor in each call, will be graded as "No Presentado" (Not Submitted). This criterion applies to both the first and second evaluation opportunities, as well as the early call. Students with recognition of part-time dedication and academic exemption waiver Students with recognition of part-time dedication and academic exemption from attendance will communicate their situation to the course instructors at the beginning of the semester, as established by the "Norma que regula el régimen de dedicación al estudio de los estudiantes de grado en la UDC" (Article 3.b and 4.5) and the "Normas de evaluación, revisión y reclamación de las calificaciones de los estudios de grado y máster universitario" (Article 3 and 8b). For students who request academic exemption, the evaluation will be the same as for the others since the ICT practicals will be completed outside of class hours. Additional information According to Article 11, section 4 b) of the "Reglamento disciplinar del estudiantado de la UDC", engaging in fraudulent behavior in any of the methodologies subject to assessment sections will result in a grade of "Fail (0)" for the final evaluation, both in the first and second opportunity, regardless of the opportunity in which the offense was committed.

Sources of information	
Basic	- Robinson, Stewart (2004). Simulation : The Practice of Model Development and Use. John Wiley & Sons - Flexsim (2020). Tutoriales Flexsim. https://docs.flexsim.com/en/20.2/Introduction/Welcome/ - García del Valle, Alejandro; Crespo Pereira, Diego; Lamas Rodríguez, Adolfo (2020). Apuntes de Simulación y Optimización. UDC
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
A sustainable use of resources must be made to prevent the negative impact on the natural environment. For this reason, the delivery of the documentary works carried out in this subject:? They will be requested in virtual format and / or computer support? It will be done through TEAMS or Moodle, in digital format without needing to print them? If it is necessary to make them on paper: a) plastics will not be used, b) double-sided impressions will be made, c) recycled paper will be used, d) the printing of drafts will be avoided.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.