Teaching Guide				
Identifying Data				2019/20
Subject (*)	Logistic Systems Simulation		Code	730497233
Study programme	Mestrado Universitario en Enxeñaría Industrial (plan 2018)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	Second	Optional	4.5
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Empresa			
Coordinador	Crespo Pereira, Diego	E-mail	diego.crespo@udc.es	
Lecturers	Crespo Pereira, Diego Lamas Rodriguez, Adolfo	E-mail	diego.crespo@udc.es adolfo.lamasr@udc.es	
Web	http://www.gii.udc.es/			
General description	Simulation is a Lean technique to design and improve processes that plays a key role in Industry 4.0. The purpose of this subject is to learn discrete events simulation applied to problem solving in logistics. Specifically, the students will have to solve design and optimization problems about internal logistics such as material handling, warehouses and storage, etc.			

Study programme competences / results	
Code	Study programme competences / results
A13	EG5 - Knowledge of management information systems, industrial organization, production systems and logistics and quality management systems.
A14	EG6 - Capacities for work organization and human resources management. Knowledge on prevention of occupational risks.
B2	CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of ??study.
B3	CB8 - That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B4	CB9 - That the students know how to communicate their conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized audiences in a clear and unambiguous way.
B6	G1 - Have adequate knowledge of the scientific and technological aspects in Industrial Engineering.
B7	G2 - Project, calculate and design products, processes, facilities and plants.
B13	G8 - Apply the knowledge acquired and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts.
B14	G9 - Be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
B15	G10 - Knowing how to communicate the conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized publics in a clear and unambiguous way.
C1	ABET (a) - An ability to apply knowledge of mathematics, science, and engineering.
C3	ABET (c) - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
C5	ABET (e) - An ability to identify, formulate, and solve engineering problems.
C6	ABET (f) - An understanding of professional and ethical responsibility.
C7	ABET (g) - An ability to communicate effectively.
C8	ABET (h) - The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
C9	ABET (i) - A recognition of the need for, and an ability to engage in life-long learning.
C11	ABET (k) - An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Learning outcomes

Learning outcomes	Study programme competences / results		
Knowledge of management information systems, industrial organization, production systems and logistics and quality management systems.	AJ13	BJ2 BJ3 BJ4 BJ6 BJ7 BJ13 BJ14 BJ15	CJ1 CJ3 CJ5 CJ6 CJ7 CJ8 CJ9 CJ11
Capacities for work organization and human resources management. Knowledge on prevention of occupational risks.	AJ14	BJ2 BJ3 BJ4 BJ6 BJ7 BJ13 BJ14 BJ15	CJ1 CJ3 CJ5 CJ6 CJ7 CJ8 CJ9 CJ11

Contents	
Topic	Sub-topic
Fundamentals of simulation with Flexsim	Fixed Resources. Task executers. Process flows. Simulation experiments.
Material handling systems simulation.	Forklifts. Conveyors. AGVs. Cranes.
Inventory simulation.	Flexsim lists. Order management. Replenishment.
Warehouse simulation.	Racks. ASRS. Placement logic. Picking.
Simulation project.	Steps of a simulation project. Case study.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Supervised projects	A14 A13 B2 B3 B4 B13 B15 B14 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	3	36	39
Guest lecture / keynote speech	A13 A14 B2 B3 B4 B13 B15 B14 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	7.5	11.25	18.75
ICT practicals	A13 A14 B2 B3 B4 B13 B15 B14 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	21	33.75	54.75
Personalized attention		0		0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Supervised projects	Projects proposed by the instructor.

Guest lecture / keynote speech	Lectures about logistics systems simulation.
ICT practicals	Simulation cases solved in class guided by the instructor.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech ICT practicals Supervised projects	Tutorials for solving doubts and problems found during the course.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
ICT practicals	A13 A14 B2 B3 B4 B13 B15 B14 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	Attendance to the ICT practicals and submission of the solved cases.	10
Supervised projects	A14 A13 B2 B3 B4 B13 B15 B14 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	Assessment of the cases solved by the students.	90

Assessment comments
O "Alumnado con recoñecemento de dedicación a tempo parcial edispensa académica de exención de asistencia" comunicarán ó inicio docurso a súa situación os profesores da materia, segundo establece a "Normaque regula o réxime de dedicación ao estudo dos estudantes de grao na UDC"(Art.3.b e 4.5) e as ?Normas de avaliación, revisión e reclamación dascualificacións dos estudos de grao e mestrado universitario (Art. 3 e 8b). Para os alumnos que soliciten a dispensa académica a avaliación será igual ao resto xa que os traballos serán completados fóra do horario de clases.

Sources of information	
Basic	- Robinson, Stewart (2004). Simulation : The Practice of Model Development and Use. John Wiley & Sons - Flexsim (2019). Tutoriales de Flexsim. - Yuri Merkuryev & otros (2009). Simulation-Based Case Studies in Logistics. Springer
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 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.