UNIVERSIDADE DA CORUÑA

Teaching Guide

Identifying Data					2022/23
Subject (*)	Simulation and Optimization of Shipbuilding Processes			**Code**	730542024
Study programme	Master Universitario Erasmus Mundus en Sostibilidade e Industria 4.0 aplicada ao Sector Marítimo				
Descriptors					
Cycle	**Period**	**Year**	**Type**		**Credits**
Official Master's Degree	1st four-month period	Second	Optional		6
Language	English				
Teaching method	Face-to-face				
Prerequisites					
Department	Empresa				
Coordinador	Crespo Pereira, Diego		**E-mail**	diego.crespo@udc.es	
Lecturers	Crespo Pereira, Diego		**E-mail**	diego.crespo@udc.es	
	Lamas Rodriguez, Adolfo			adolfo.lamasr@udc.es	
	Pernas Álvarez, Javier			javier.pernas2@udc.es	
Web					
General description	The goal of this subject is to provide a basic theoretical and practical understanding of modelling and simulation technologies (M&S) applied to shipbuilding. M&S is considered one of the Industry 4.0 technologies that allows shipyards to optimize manufacturing processes and logistics. The simulation software Flexsim will be used to solve practical cases based on real problems solved in shipyards.				

Study programme competences / results	
Code	**Study programme competences / results**
B7	CG1 ? To display the adequate intercultural competence to successfully navigating within multicultural learning environments and to implement basic management principles suitable for a multicultural working environment.
B8	CG2 ? To express an attitude of intellectual inquisitiveness and open-mindedness.
B11	CG5 ? To have the capability to identify, formulate and solve engineering problems within realistic constraints.
B13	CG7 ? To have the capability to critically analyse, synthesise, interpret and summarise complex scientific processes.
C2	CT2 - Mastering oral and written expression in a foreign language.
C3	CT3 - Using ICT in working contexts and lifelong learning.
C4	CT4 - Acting as a respectful citizen according to democratic cultures and human rights and with a gender perspective.
C6	CT6 - Acquiring skills for healthy lifestyles, and healthy habits and routines.
C7	CT7 -Developing the ability to work in interdisciplinary or transdisciplinary teams in order to offer proposals that can contribute to a sustainable environmental, economic, political and social development.

Learning outcomes			
Learning outcomes	**Study programme competences / results**		
Knowledge of the methods and strategies applied to shipbuilding.		BC6	CC2
		BC7	CC3
		BC10	CC4
		BC12	CC6
			CC7
Capacity to understand and to implement simulation and optimization of shipbuilding processes.		BC6	CC2
		BC7	CC3
		BC10	CC4
		BC12	CC6
			CC7

Contents	
Topic	**Sub-topic**
Modelling and Simulation	The M&S methodology. M&S technologies. Simulation projects.
Model development in Flexsim	Flexsim basics. Fixed resource library. Task executers. Networks and conveyors. Introduction to process flows.
Shipbuilding processes	Cutting-welding. Block assembly. Outfitting. Painting. Blocks erection.
Shipyard simulation.	Material receipts. Assembly workstations. Blocks erection. Cranes. Planning.
Optimization	Input data analysis. Simulation experiments. Optimization concepts. Linear models. Heuristics. Evolutionary algorithms.

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
ICT practicals	A2 A3 B7 B8 B11 B13 C2 C3 C4 C6 C7	15	15	30
Case study	B7 B8 B11 B13 C2 C3 C4 C6 C7	4.5	22.5	27
Supervised projects	A2 A3 B7 B8 B11 B13 C2 C3 C4 C6 C7	1.5	40.5	42
Mixed objective/subjective test	B7 B8 B11 B13 C2 C3 C4 C6 C7	2	2	4
Guest lecture / keynote speech	A2 A3 B8 B11 B13	21	21	42
Personalized attention		5	0	5

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	**Description**
ICT practicals	Solving practical problems and case studies using Flexsim.
Case study	Solving practical cases proposed by the teachers
Supervised projects	Simulation project proposed by the teachers
Mixed objective/subjective test	Final exam about the contents of this subject.
Guest lecture / keynote speech	Lectures on the subject contents

Personalized attention	
Methodologies	**Description**
ICT practicals Mixed objective/subjective test Guest lecture / keynote speech Case study Supervised projects	During tutorial time, students can meet the teachers to clarify the doubts of the subject, as well as the ones concerning the supervised projects

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**

Mixed objective/subjective test	B7 B8 B11 B13 C2 C3 C4 C6 C7	Assessment of the final exam	20
Case study	B7 B8 B11 B13 C2 C3 C4 C6 C7	Assessment of the practical cases assigned to the students.	20
Supervised projects	A2 A3 B7 B8 B11 B13 C2 C3 C4 C6 C7	Assessment of the supervised project assigned to the students.	60

Assessment comments
Assessment criteria
Second opportunity
The assessment criteria for the first and the second opportunity are the same.
'No Presentado' grade
The grade of "No presentado" (no grade) will be given to those students who will not hand in the supervised project.
Additional information
Fraudulent behaviour in any of the parts subject to assessment will result in the grade of "Fail (0)" in the final assessment.
General EMJMD Sustainable Ship and Shipping SEAS 4.0 evaluation rules:
- Students will have only two oportunities to pass a course. If failing to do so, they may be forced to leave the degree.
- No part time or lecture attendance exemption are allowed in this degree.

Sources of information	
Basic	- Robinson, Stewart (2004). Simulation : The Practice of Model Development and Use. John Wiley & Sons - Flexsim (2022). Flexsim Tutorials. - Banks, Jerry Carson, Jhon S. Nelson, Barry L. Nicol, David M. (2010). Discrete-Event System Simulation. Prentice Hall
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
To help in achieving a sustainable environment and to get the objective of number 5 action of the "Ferrol Green Campus Action Plan" (Healthy and environmentaly and socially sustainable research and teaching): The assignments to be done in this course: - Will be required in digital format. - Will be delivered using Moodle, with no need to print them. In case it is necessary to print them: - Plastics won´t be used. - Two side printing will be used. - Recycled paper will be used. - Printing drafts will be avoided. A sustainable use of the resources should be done, together with the prevention of negative impacts on the environment.