

SUBJECT TEACHING GUIDE

M1443 - Computational Modelling in Engineering

Master's Degree in Civil Engineering

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Master's Degree in Civil Engineering			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline	Mathematical and Computational Foundations of Engineering				
Course unit title and code	M1443 - Computational Modelling in Engineering				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA GEOGRAFICA Y TECNICAS DE EXPRESION GRAFICA
Name of lecturer	CESAR ANTONIO OTERO GONZALEZ
E-mail	cesar.otero@unican.es
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 2. DESPACHO PROFESORES (2035)
Other lecturers	VALENTIN ARROYO FERNANDEZ VICTOR MANUEL GIL ELIZALDE MIGUEL CUARTAS HERNANDEZ VALENTIN GOMEZ JAUREGUI CRISTINA MANCHADO DEL VAL MARIA DOLORES FRIAS DOMINGUEZ JESUS FERNANDEZ FERNANDEZ

3.1 LEARNING OUTCOMES

- Students will gain an understanding of random variables that influence engineering projects and how they are treated.
- They will be able to statistically model extreme events, choosing the most appropriate model for each situation.
- They will be able to conduct studies on the reliability of the engineering works and raise the engineering problems as optimization problems.
- They will be able to conduct studies on the reliability of the engineering works and raise the engineering problems as optimization problems.
- Applied knowledge of CAD / BIM libraries for civil engineering.
- Ability to develop and integrate automation software or modeling tasks of civil engineering project.
- Knowledge of techniques and tools in the application of engineering simulation graphical models.

4. OBJECTIVES

- Students will realize that the variables involved in the engineering problems are essentially random.
- They will know how the random variables are discussed in the engineering problems.
- They will know how to treat the reliability of civil works and to describe and analyze the different failure modes.
- They will know how to handle standard optimization tools
- Knowledge and basic handling of the main data structures for modeling and projecting civil engineering.
- Applied knowledge of CAD / BIM libraries for civil engineering.
- Ability to develop and integrate software for automation or modeling of civil engineering project tasks.
- Knowledge of techniques and tools applicable in graphic simulation of engineering models.
- Ability to develop applications for use in an engineering office

6. COURSE ORGANIZATION

CONTENTS

1	Object-oriented programming. Office automation tools and databases. Creating highly interactive graphical models.
2	<p>COMPUTER MODELS CAD / CAE. CAD / CAE Computational models for civil engineering. Standards, libraries automation and realistic representation. IFC BIM. Application development tools and utilities for use in civil engineering projects.</p> <p>SESSION 1. Access to AutoCAD objects. Methods, properties and events. Creating and editing graphic objects. SESSION 2. Programming interactivity. Access to graphical user events. Design and implementation of basic forms. SESSION 3. Programming selection sets. SESSION 4. Programming with typical civil engineering objects: land, alignments, corridors, etc.</p> <p>LEVELLING SESSION (OPTIONAL FOR STUDENTS SUPPORT): Loading DVB or similar projects. Basic searching and sorting techniques.</p>
3	<p>Most commonly used discrete and continuous probability models Extreme value theory. Probability paper. Reliability and optimization in Civil Engineering. Applications.</p> <p>SESSION 1: Common probability models in civil engineering. SESSION 2: Order statistics. Exact and asymptotic models for extreme events. SESSION 3: Graphical methods. Probability paper. SESSION 4: Threshold exceedence. Exact and asymptotic models. SESSION 5: Reliability and Optimization in Civil Engineering.</p>

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Part 1: work	Work	No	Yes	33,00
Part 2: laboratory exam	Laboratory evaluation	No	Yes	33,00
Part 3: written exam	Written exam	No	Yes	16,00
Part 3: Computer lab reports	Work	No	Yes	18,00
TOTAL				100,00
Observations				
Remedial exams are always of the same type and about the same contents than those that were not passed				
Observations for part-time students				
<p>Attendance is very necessary for students since lessons are very practical. Part-time students must talk to the lecturer in charge at the very beginning of the course in order to receive particular suggestions and instructions According to the assessment regulation, part-time students have the right to take a single exam, that will be carried out at a date officially established by the academic board.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC
Transparencias del curso facilitadas por los profesores.
E. Castillo and R. E. Pruneda Estadística Aplicada. Editorial Moralea, Albacete, España, 2001. ISBN: 84-923157-4-1.
E. Castillo, A. S. Hadi, N. Balakrishnan, and J. M. Sarabia. Extreme Value and Related Models with Applications in Engineering and Science, Wiley Series in Probability and Statistics, Wiley, 2005. ISBN: 0-471-67172-X.
E. Castillo, A. Conejo, P. Pedregal, R. García and N. Alguacil. Formulación y Resolución de Modelos de Programación Matemática en Ingeniería y Ciencia. Publicaciones de la Universidad de Castilla-La Mancha, 2002. ISBN: 84-600-9751-X.
Manuales del desarrollador de AutoCAD REVIT Structure
Manuales del desarrollador de AutoCAD Civil 3D
Eastman C., Teicholz P., Sacks R., Liston K. BIM Handbook A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors. 2008 John Wiley & Sons.
C# 5.0 in a Nutshell, 5th Edition. 2012. Joseph Albahari & Ben Albahari. O'Reilly.
Programming Windows, 6th Edition. 2012. Charles Petzold. Microsoft Press.
http://unity3d.com/learn
Computing in Civil Engineering. Proceedings of the 2012 ASCE International Conference on Computing in Civil Engineering. ISBN 978-0-7844-1234-3.
Microsoft Excel 2013: Building Data Models with PowerPivot 2013. Alberto Ferrari & Marco Russo. Microsoft Press.