

## SUBJECT TEACHING GUIDE

G1700 - Modeling And Simulation In Machine Design

Degree in Mechanical Engineering

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Degree in Mechanical Engineering			Type and Year	Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Design and Manufacturing Optional Module: Mechanical Engineering				
Course unit title and code	G1700 - Modeling And Simulation In Machine Design				
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 ESTRUCTURAL Y MECANICA				
Name of lecturer	ANA MAGDALENA DE JUAN DE LUNA				
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Other lecturers	ALBERTO DIEZ IBARBIA CESAR AGUADO VELA				

### 3.1 LEARNING OUTCOMES

- To know Multibody Systems and Finite Element Method.
- To develop basic-medium models and discuss critically the results.
- To implement the theoretical knowledge in a commercial software.

#### 4. OBJECTIVES

To develop basic-medium models and discuss critically the results.

To know the technical language properly.

To develop basic-medium models and discuss critically the results.

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	Introducción
2	Static problems using Finite Element Method a. Theoretical background. b. 3D, 2D and 1D elements. c. Modeling techniques d. Modeling and solution using a commercial software: Graphical preprocessing, processing y postprocessing.
3	Dynamic problems using Finite Element Method a. Modal analysis. b. Forced response.
4	Kinematic simulation of multibody systems. a. Coordinates: type, number and selection. b. Constraint equations: type, number and selection. c. Position, velocity and acceleration equations: statement and solving methods. d. Modeling and solution using a commercial software: Graphical preprocessing, processing y postprocessing.
5	Dynamic simulation of multibody systems. a. Dynamic equations: statement, transformation and solving methods. b. Types of loads. c. Modeling and solution using a commercial software: Graphical preprocessing, processing y postprocessing.

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Finite element software	Work	No	Yes	25,00
Finite Element test	Written exam	No	Yes	25,00
Multibody software	Work	No	Yes	25,00
Multibody test	Written exam	No	Yes	25,00
TOTAL				100,00
Observations				
In order to pass the course, it is necessary to obtain 5 points as an average computed by all tests.				
Observations for part-time students				
Part-time students may either take the mid-term tests or the final test.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

Avilés González, Rafael.  
Elementos finitos para el análisis y diseño de sistemas mecánicos. Parte I, Problemas estáticos lineales / Rafael Avilés, Goizalde Ajuria.  
Editorial: Bilbao : Universidad del Pais Vasco, 1998.

El método de los elementos finitos / O.C. Zienkiewicz, R.L. Taylor.  
Edición: 5a ed.  
Editorial: Barcelona : Centro Internacional de Métodos Numéricos en Ingeniería, 2004. ISBN: 84-95999-51-X : (O.C.)

Avilés González, Rafael.  
Análisis dinámico mediante elementos finitos / Rafael Avilés, M.B. Goizalde Ajuria. Editorial: Bilbao : Universidad del Pais Vasco, 1995.

Javier García de Jalón and Eduardo Bayo  
Kinematic and Dynamic Simulation of Multibody Systems: The Real-Time challenge ISBN 0-387-94096-0  
Springer-Verlag, New-York, 1994

Edward J. Haug, Computer Aided Kinematics and Dynamics of Mechanical Systems (Allyn and Bacon, 1989)