

## SUBJECT TEACHING GUIDE

M874 - Science and Technology of Geometric Design (CAD, CAGD)

Master's Degree in Industrial Engineering Research

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in Industrial Engineering Research			Type and Year	Optional. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Transversal Competences for R&D&I Module - Sustainable Design in Industrial Systems Electroenergetic Module Electromechanic / Mechatronics Module				
Course unit title and code	M874 - Science and Technology of Geometric Design (CAD, CAGD)				
Number of ECTS credits allocated	5	Term	Semester based (2)		
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	VICTOR MANUEL GIL ELIZALDE ANDRES IGLESIAS PRIETO AKEMI GALVEZ TOMIDA

### 3.1 LEARNING OUTCOMES

- Development of CAD/CAE applications, essentially focused on the field of mechanical engineering.
- CAGD algorithms
- Study of object libraries and API for CAD/CAE automation
- Algorithmical and numerical foundation of the main CAGD techniques
- Improvement of skills in the next fields. Spoken and written communication. Team working. Computer assisted media. Technological innovation. Critical thinking. Self-learning. Using scientific literature. Implementation of a CAGD system.
- Expertise and autonomy for posing a process of development of a CAGD system
- Ability to specify and develop macroinstructions in an CAD API orienting the result towards a technology transfer process
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### 4. OBJECTIVES

- Understanding, analyzing and critically explaining the basic foundations of Computer Aided Geometric Design.
- Capability for posing a computational model for a CAGD system, including the specification for geometric and numeric entities, their potential pros, limitations and connections into a design environment.
- Theoretical and practical knowledge of a CAD API. Design of applications oriented to the (total or partial) automation of a production process. Design of user interfaces able to make it this technology easier to manage for the Industry.

### 6. COURSE ORGANIZATION

#### CONTENTS

1	<p>Mathematical foundations of Computer Aided Geometric Design (CAGD)</p> <p>Application to Industry problems</p> <p>Proposal for the design and implementation of a CAGD system.</p> <p>Computer practices on basic entities of CAGD (curves, surfaces, industrial formats)</p>
2	<p>CAD Object models. Settings, documents, object collections, objects, properties, methods and events.</p> <p>Programming with Open Inventor API</p> <ul style="list-style-type: none"> <li>Creating and modifying sketches</li> <li>Programming constraints</li> <li>Working point, axes and plans</li> <li>Creating profiles</li> <li>Programming Boolean operations</li> <li>Programming features (fillet, holes, ribs, etc.)</li> <li>Programming assemblies</li> <li>Programming layouts</li> </ul>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous assessment: CAD laboratory practices	Laboratory evaluation	No	Yes	60,00
Final work	Work	No	Yes	40,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>Laboratory evaluation is recovered with a similar exercise. The final work of the subject is recovered with the improvements proposed on the initial delivery. The work can have a debate with the teacher.</p> <p>IT IS EXPECTED THAT, IN THE EVENT THAT THE SOCIAL DISTANCE MEASURES ESTABLISHED BY THE SANITARY AUTHORITIES DO NOT ALLOW THE PRESENCE OF THE EXTRAORDINARY CALL EXAM EVALUATION, THIS EVALUATION WILL DEVELOP VIRTUALLY; IN MOODLE THE SPECIFIC CONDITIONS OF REALIZATION WITH THE SUFFICIENT ADVANCE WILL BE EXPLAINED. IN THIS CASE, STUDENTS WILL NEED TO HAVE : INTERNET CONNECTION, COMPUTER AND HAVE THE REQUESTED PROGRAMS INSTALLED.</p>				
<b>Observations for part-time students</b>				
<p>Attendance is very necessary for students since all the classes are very practical. Part-time students must talk to the lecturer in charge at the very beginning of the course</p>				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC
Vera Anand: Computer Graphics and Geometric Modeling for Engineers. John Wiley & Sons (1993)
Brüderlin, Beat; Roller, Dieter. Geometric constraint solving and applications. Springer, cop. 1998
L. Piegl, W. Tiller: The NURBS Book. Springer Verlag, 2nd. ed. (1997)
Groover, Mikell P. Automation, production systems, and computer-integrated manufacturing. - Upper Saddle River, N.J.: Prentice-Hall, cop. 2001
G. Farin: Curves and Surfaces for CAGD. Academic Press, 4th ed. (1996)
INVENTOR: AUTOMATION GUIDE AND API REFERENCE. AUTODESK