30103 - Graphic expression and computer-assisted design

Información del Plan Docente

Academic Year	2016/17
Academic center	175 - Escuela Universitaria Politécnica de La Almunia 179 - Centro Universitario de la Defensa - Zaragoza
Degree	425 - Bachelor's Degree in Industrial Organisational Engineering 563 - Bachelor's Degree in Industrial Organisational Engineering 457 - Bachelor's Degree in Industrial Organisational Engineering
ECTS	6.0
Course	1
Period	First semester
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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The learning process that is designed for this subject is based on the following:

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A strong interaction teacher/student. This interaction becomes a reality by a division of labor and responsibilities between students and teachers. However, to some extent, the students will be allowed to set up their own pace of learning according to their needs and availability, following the guidelines set by the teacher.

The teaching organization is based on the number of ECTS credits, which represents, in this case 150 hours of student work on the subject during the semester (15 weeks tuition). 60 hours will be held in the classroom and LAB and the rest will be autonomous work.

The organization of the actual teaching will be based on the following guidelines:

- **Theory Classes** : theoretical activities conducted by the teacher, so that the theoretical support of the subject is given, highlighting the major issues, structuring them on chapters and / or sections and connecting them to each other.
- **Classroom practice work/seminars/workshops** : Theoretical discussion activities or practice work preferably performed in the classroom and requiring high student participation and a performance directed by the teacher.
- **Lab Practice work:** The total group of master classes will be divided into several groups according to the number of students enrolled, but never more than 20 students, so that smaller groups are formed. CAD-CAE Practical Activities with the relevant software will be made in the Technical Office classroom.
- **Group tutorials:** Scheduled tracking learning activities in which the teacher meets with a group of students to guide their autonomous learning work and consultancy of targeted work or tasks that require a very high degree of advice from the teacher. Essentially a number of hours will be required for such group monitoring (to agree with each of the groups, with at least the specified time in the **Calendar** section of this document).
- **Individual tutorials:** These are made on a one-to-one basis, at the department. They aim to help solving problems that are the students might have, particularly those which for several reasons cannot attend group tutorials or need a more personalized attention. These tutorials may be face-to-face or virtual (Moodle or email).

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The learning process for this course was designed based on the encouragement of the student's continual work, applying the theoretical contents in practical exercises and projects, which are completed individually or in groups, during the practical lessons.

During the master classes, the most important concepts of engineering drawing are presented using real examples, so that students can identify similar factors in the exercises performed during the course.

5.2.Learning activities

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The program that the students are offered to help them achieve the expected results involves the following activities...

Active participation of the students, so that, to achieve the learning outcomes (Considering the experimental level is high, which means a 2h a week for Theory, 2h for practice work and 6 for other activities),no redundancy intended with the above mentioned, the following activities will be developed

- Face-to-face Generic Activities:

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- **Theoretical classes:** the concepts and procedures of the subject will be developed and practical examples as support will be developed
- **Practical classes:** problems and case studies will be done to complement the theoretical concepts studied
- **Lab practice work:** Students will be divided into several groups not bigger than 20 students / being monitored by the teacher.

- Non-class Generic Activities:

- Study and assimilation of the concepts and procedures outlined in the laboratory.
- Understanding and assimilation of the problems and practical cases solved in practical lessons.
- Organization of seminars, suggested problems solving, etc.
- Organization of laboratory practice work, development of scripts and reports.
- Preparation of written continuous assessment tests, final exams and final project (as applicable).

- Monitored autonomous activities: Although they will rather have a mixed nature between face-to-face and non-class tuition they have been considered separately and will be focused mainly to seminars and tutorials under the supervision of the teacher.

- Reinforcement activities: With a remarkable non-class nature, through a virtual learning portal (Moodle, e-mail) several activities that reinforce the basic contents of the subject will be carried out. These activities can be customized or not, and will be monitored through the portal.

The subject consists of 6 ECTS credits, which represents 150 hours of the student work during the semester, i.e. 10 hours per week for 15 tuition weeks.

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1. Master classes (20h): Classroom sessions where the theoretical concepts are exposed and explained to the students.

2. Practical classes (20 h): Classroom sessions where the contents learnt during the master classes are applied.

3. Computer lab sessions (20 h): In-class sessions with required attendance. During these sessions, with the help of a computer, the student learns to use the Solidworks software, a parametric software to model in 3D.

4. Group or independent work (85 h): The part of the course where the student should assimilate the knowledge explained and worked during the sessions with required attendance through their autonomous study.

During the semester, they are faced with:

- Voluntary tasks related to each of the topics explained. The tasks are later corrected.

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- Compulsory and mandatory handing in of manually executed graphical exercises *

- Compulsory and mandatory modelling of a CAD ensemble * (parts, assembly and planes)

5. Assessment criteria (5 h): Evaluation of the entire course curriculum (attendance required).

- Theoretical and practical exam* (3 h) of the whole subject

- CAD Exam * (2 h). Management of the software and application to the course

* The final grade of the course is composed of 50% of the theory and practice exam and the remaining 50% of a sum of evaluable mandatory exercises, the CAD Exam and exercise, according to the completion requirements in terms of time and knowledge.

(For more information, see the "Assessment" section)

Theory hours					
Required attendance hours				Non-required attendance hours	Total
Master classes	Practical classes	Computer lab sessions	Evaluation	Group or independent work	
20	20	20	5	85	150

5.3.Program

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Essential Contents of the subject for the achievement of learning outcomes

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As discussed above, the subject to be developed along the course is dividedin **2 well-differentiated parts:**

1. THEORETICAL CONTENTS Part 1

- **Technical Drawing and Representation Systems**

Theoretical and practical part to be held in the classroom assigned for this purpose and during the 1st semester (2 hours per week). In turn, this 1st part consists of 2 sections:

- **Section P1_1:** *Geometric Plotting. Basic standardization* **.**
- **Section P1_2:** *Industrial Technical Drawing*

SECTION P1_1: Geometric Plotting. Basic Standards	
Unit 1	**Metrics and Geometric Plotting** **1.1 Introduction to Industrial Technical Drawing** **1.2 Standardization in Technical Drawing** **1.3 Geometric Plotting Techniques Curves** **1.4 Symbols used in S.D.**
Unit 2	**Sketching** **2.1 Introduction** **2.2 General issues about Sketching** **2.3 Sketching prismatic, cylindrical and mixed pieces.** **2.4 Exercices**
Unit 3	**DIMENSION DRAWING** **3.1 General Principles** **3.2 Classification of Plan Views**

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	3.3 Dimensioning Systems **3.4 Dimensioning parts** **3.5 Exercises**
Unit 4	**Views and Sections** **2.1 Introduction** **2.2 General issues about Sketching** **2.3 Sketching prismatic, cylindrical and mixed pieces.** **2.4 Exercises**
Unit 5	**Thread Representation** **5.1 Introduction** **5.2 Representation of threads according to Standards** **5.3 Dimensioning of threads. Screw ends** **5.4 Threaded Blind holes** **5.5 Exercises**
Unit 6	**Cone-shaping, Convergence, Tilt or Pending** **6.1 Introduction** **6.2 Cone-shaping, Convergence, Tilt or Pending** **6.3 Dimensioning** **6.4 Exercises**

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SECTION P1_2: Industrial Technical Drawing. Advanced Standards	
Unit 7	**Detachable and Fixed Joint Components** **7.1 Introduction** **7.2 Setting Standard Components** **7.3 Screws, Nuts, Washers and Pins. Countersink** **7.4 Cotter pins and pull tabs.** **7.5 Nerved Axes** **7.6 Rivets and Welding. General Issues**
Unit 8	**Sets and Detail Drawing. Materials** **8.1 Set Drawing. Company Criteria and Standards** **8.2 Plans in assembly drawings** **8.3 Detail Drawing.** **8.4 Detail Drawing Plans.** **8.5 Ferrous and Non-Ferrous Materials** **8.6 Material Standards used in Industry** **8.7 Practical Exercise (Final Exercise).**
Unit 9	**Surface Signs and Tolerances** **9.1 Introduction** **9.2 Types of Surfaces**

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	9.3. Roughness. Basic concepts **9.4 Machining Signs. Knurling. Standards. Display in Drawings** **9.5 Tolerances. Fundamental concepts** **9.6 Tolerances systems. Using Tables** **9.7 Tolerances Consignment in Drawings. Standards** **9.8 Exercises**
Unit 10	**Gearwheels** **10.1 Introduction** **10.2 Gear concept** **10.3 Drawings of gearwheels and gears. Standards** **10.4 cylindrical and conical Wheels** **10.5 Worm screw Gears. Dimensioning** **10.6 Exercise**
Unit 11	**Bearings** **11.1 Introduction** **11.2 Classification of bearings. Ball, Roller and Needle Bearings** **11.3 Recommended Settings** **11.4 Safety and Security Concerns in Bearings** **11.5 Oilers**

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2. THEORETICAL CONTENTS Part 2

Knowledge and application of CAD / CAE Tools

Theoretical and practical part to be held in the O.T. classroom, and throughout the 1st semester (2 hours per week).

In turn, this 2nd part consists of 2 sections:

*** Section Q2_1:** Knowledge and Applications in the development of CAD / CAE (I).

*** Section P2_2:** Knowledge and Applications in the development of CAD / CAE (II).

SECTION Q2_1: Knowledge and Development Application in CAD-CAE (I)	
Unit 1	**Introduction to the Modeling Process** **1.1 User Interface** **1.2 Predefined Operations Modeling** **1.3 Parametric Solid Process and Techniques** **1.4 Operation Modification**
Unit 2	**Working with Sketches** **2.1 Creating Sketchers. Standards** **2.2 Sketch Operations. Restrictions** **2.3 Dimensioning and Editing Sketches**
Unit 3	**Introduction to Operations**
	3.1 Working with Sketch Drawings **3.2 Creating Operations**

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	3.3 Using Job Operations: Plans, Axes and Working Points **3.4 Adding Predefined Operations to the Components. Hole, Junction,** **Chamfer and Emptying Operations** **3.5 Pattern Operations**
Unit 4	**Assemblies (Sets, Groups or Functional Units)** **4.1 Assembly Modeling Basics** **4.2 Adaptive Components / Parts** **4.3 Situation, Creation and Restrictions of Components in Assemblies** **4.4 Navigator** **4.5 Moving and Changing Properties** **4.6 Section Views**
Unit 5	**Documentation**
	5.1 Creating Drawing Standards. Boxes. Texts... **5.2 Resources and Views on the Plans** **5.3 Modifications of Views and Sections. Annotations** **5.4 Creating Plans. Sheet Treatment** **5.5 Single Part Plans and Assemblies** **5.6 Making Plant Views**

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	5.7 Printing Plans
Unit 6	**Presentation -Exploding-** **6.1 Creating Views** **6.2 Moving and Creating Trajectories** **6.3 Controlling camera views** **6.4 Exploding Animations** **6.5 Creating IPN and AVI files**

SECTION P2_2: Knowledge and Application in the Development of CAD-CAE (II)	
Unit 7	**Schemes Development Software** **7.1 User Interface and Database** **7.2 Symbols: Generation and Application** **7.3 Scheme and Lists Generation** **7.4 Printing.**

3. PRACTICAL CONTENTS. Part 1 and Part 2

Each unit presented in the previous sections **(Part 1 and Part 2)** , have associated practices, both/either through practical cases, interpretation and commentary on readings associated with the subject and/or work leading to the achievement of results and their analysis and interpretation.

As topics are developed such practices will be dealt with, either in the classroom, lab (OT room) or through the Moodle platform, as indicated in the Assessment of activities section (and corresponding table), and Planning section (and its calendar)

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TEMA 0.- Basic concepts of metric geometry

0.1. Fundamental graphic drawings

0.2. Fundamental constructions

0.3. Figures and geometric shapes

TEMA 1.- Engineering drawing Standards I

1.1. Scales

1.2. Formats

1.3. Types of lines

1.4. Lettering

TEMA 2.- Descriptive geometry

2.1. Orthographic projection

2.1.1. Basis of the orthographic projection

2.1.2. Views

2.2. Axonometric projection

2.2.1. Isometric projection

2.2.2. Oblique projection

2.3. Topographic system

2.3.1. Topography. Topographic profiles

2.3.2. Site Work

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TEMA 3.- Engineering drawing Standards II

3.1. Dimensioning

3.2. 3.2 Cuts & sections

TEMA 4.- Engineering drawing Standards III

4.1. Assemble planes

4.2. Exploded planes.

4.3. Standard features

Computer Aided-Design (CAD)

1. Basis model of parts. Sketch and basis operations
2. Planes
3. Assembly of parts
4. Advanced options of representation

5.4.Planning and scheduling

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Session Schedule and Presentation of Projects

In the following table, a tentative schedule which includes the development of activities presented above is shown, with possible modifications depending on the development of the teaching activity.

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Week	Theory	Exercises	Type 1	Type 2	Type 3	Type 7	Type 8	Value
1	Presentation Scales, formats, lettering		2	2				2,7%

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	and lines							
2	Descriptive geometry		2	2		3		4,7%
3	Descriptive geometry		2	2		4		5,3%
4	Descriptive geometry		2	2		4		5,3%
5	Descriptive geometry		2	2		4		5,3%
6	Engineering drawing Standards: Dimensioning	Exercise 1			4	6		6,7%
7	CAD	Delivery of Exercise 2			4	6		6,7%
8	CAD		2		2	4		5,3%
9	Engineering drawing Standards: Cuts & Sections		2	2		8		8%
10	CAD and engineering drawing Standards: Cuts & Sections	Deadlines Exercise 2			4	8		8%
11	CAD		2	2		8		8%
12	Engineering drawing Standards: Assemble				4	8		8%

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	planes and CAD							
13	CAD			2	2	8		8%
14	CAD	Delivery of Exercise 3	2	2		8		8%
15	Refresher class		2	2		6		6,7%
	Theory and practice exam						5	3,3%
Total			20	20	20	85	5	150

5.5.Bibliography and recomended resources

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- Diseño e ingeniería con Autodesk Inventor / Javier Suárez Quirós ... [et al.] ; con la colaboración de Alfonso Iglesias Sánchez Madrid : Pearson Educación, D. L. 2006
- Caddy junior : CAD para principiantes y cualquiera que desee iniciarse Bilbao : Constructora de Equipos Eléctricos, cop. 1989

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· Normas UNE. AENOR ediciones

· Apuntes propios de la asignatura

· Expresión Gráfica para ingenieros. Alberto Fernández Sora. Textos Docentes Centro Universitario de Defensa

· Dibujo Industrial: Normalización. Manuel Calvo. Publicaciones Universidad de Zaragoza

· Dibujo Técnico 2: Bachillerato. Jesús Álvarez. Ediciones SM

· Sistema de Planos Acotados y sus aplicaciones. Carlos Gordo Monsó y José Luis García Calleja. Editorial: Cultiva Libros S.L.

· Solidworks Práctico I: Pieza, ensamblaje y dibujo.Sergio Gómez González. Editorial S.A. Marcombo. ISBN: 9788426718013