ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

563000072 - Manufacturing projects developed in cam environments

DEGREE PROGRAMME

56AC - Master Universitario en Ingenieria en Dise?o Industrial

ACADEMIC YEAR & SEMESTER

2017/18 - Semester 2

Index

Learning guide

1. Description

1.1. Subjet details

Name of the subject	563000072 - Manufacturing projects developed in cam environments
No of credits	4.5 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	56AC - Master Universitario en Ingenieria en Dise?o Industrial
Centre	Escuela Tecnica Superior de Ingenieria y Diseño Industrial
Academic year	2017-18

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Roque Calvo Iranzo	B050-2	roque.calvo@upm.es	Sin horario.
Piera Maresca	A-107	piera.maresca@upm.es	Sin horario.
Jesus Caja Garcia (Subject coordinator)	A-107	jesus.caja@upm.es	Sin horario.

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

- Diseño avanzado de solidos y superficies

3.2. Other recommended learning outcomes

- Knowledge of CAD environments

- Knowledge of mechanical manufacturing technologies

4. Skills and learning outcomes *

4.1. Skills to be learned

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios

CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CE1 - Capacidad de diseñar, innovar y gestionar nuevos productos teniendo en cuenta criterios de calidad y medioambientales

CE4 - Capacidad de manejar e integrar las herramientas de representación, simulación y cálculo CAD-CAM-CAE para una correcta definición del producto diseñado

CE7 - Capacidad para realizar proyectos de lanzamiento y comercialización de productos

CE8 - Capacidad para aplicar herramientas de visualización y generación virtual de productos

CG1 - Capacidad para fomentar, en contextos académicos y profesionales, el avance tecnológico, social o cultural dentro de una sociedad basada en el conocimiento

CG10 - Capacidad de integrarse en el ámbito empresarial a través del diseño y la innovación o a través de proyectos de diseño operativo

CG2 - Capacidad para integrar aspectos estéticos en los productos de diseño sin perder la funcionalidad

CG3 - Conocimiento de las herramientas de visualización y generación de productos de diseño

CG4 - Conocimiento de los procesos industriales para ser capaz de decidir sobre los criterios adecuados en la fabricación de productos

CG5 - Capacidad de integrar herramientas de representación en los procesos de fabricación

CG7 - Capacidad de integrar metodologías, tecnologías, procesos y herramientas en el campo de la ingeniería y el diseño industrial

CG8 - Conocimiento, comprensión y capacidad para aplicar la legislación necesaria en el ámbito de la ingeniería y producción

CT1 - Capacidad para comunicarse con profesionales de su ámbito, con la comunidad académica en su conjunto y con la sociedad en general acerca de sus áreas de conocimiento

CT2 - Ser capaz de negociar y trabajar en equipo así como de manera autónoma en un contexto internacional, multidisciplinar y multicultura

CT3 - Ser capaz de organizar y planificar el tiempo de trabajo propio o de un equipo de trabajo

CT4 - Capacidad para comprender y aplicar la responsabilidad ética y la deontología profesional en sus actuaciones

CT5 - Capacidad para desarrollar y ejercitar la creatividad

CT7 - Capacidad para comunicarse en lengua inglesa en un entorno profesional

4.2. Learning outcomes

RA18 - Adquisición del conocimiento y capacidad práctica para la programación automatizada de máquinas herramienta dotadas de sistemas de control numérico en entornos CAT/CAM.

RA16 - Adquisición de la capacidad de gestionar todas las variables para la fabricación de nuevos productos industriales.

RA15 - Adquisición de la capacidad de comprensión y gestión de las problemáticas técnicas, tecnológicas, organizativas ligada a los procesos productivos

RA17 - Adquisición de la capacidad de desarrollar y modificar la geometría (dimensiones, tolerancias...) de los productos industriales para su adecuación a los procesos productivos.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

No hay descripción de la asignatura.

5.2. Syllabus

1. Analysis of manufacturing projects and mechanical engineering design
    1.1. Analysis of manufacturing projects and mechanical engineering design
2. Design and selection of manufacturing processes
    2.1. Analysis of the usual processes in mechanical manufacturing.
    2.2. Capacities of manufacturing processes
    2.3. Casting processes
    2.4. Machining processes
3. Geometric dimensioning and tolerancing (GD&T)
    3.1. Procedures and methods for computer aided tolerancing (CAT) in design and manufacturing

3.2. Statistical tolerances analysis

3.3. Methods for tolerance optimization design

3.4. Procedures for automatic tolerances assignment

4. Computer Integrated Manufacturing (CIM) systems

4.1. CIM system architecture

4.2. Computer Aided Process Planning (CAPP) subsystems

4.3. Computer Aided Manufacturing Engineering (CAME) subsystems

4.4. Computer Aided Manufacturing (CAM) subsystems for the manufacturing of complex geometry parts and assemblies

5. CAM subsystems

5.1. Analysis of processes for CAM subsystems

5.2. Parametric modelling of advanced CAM

5.3. CAM for assembly

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	**Unit 1** Duration: 02:00 Lecture			
2	**Unit 1** Duration: 02:00 Lecture **Unit 3** Duration: 02:00 Lecture			
3	**Unit 2** Duration: 02:00 Lecture **Unit 3** Duration: 02:00 Lecture			
4	**Unit 2** Duration: 02:00 Lecture **Unit 3** Duration: 02:00 Lecture			**Partial continuous assessment** Individual work Continuous assessment Duration: 02:00
5	**Unit 4** Duration: 02:00 Lecture	**Laboratory - Practice 1** Duration: 02:00 Laboratory assignments		**First CourseWork** Group work Continuous assessment Duration: 00:00
6	**Unit 4** Duration: 02:00 Lecture	**Laboratory - Practice 1** Duration: 02:00 Laboratory assignments		
7	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 1** Duration: 02:00 Laboratory assignments		
8	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 1** Duration: 02:00 Laboratory assignments		**Second CourseWork** Individual work Continuous assessment Duration: 02:00 **Third CourseWork** Group work Continuous assessment Duration: 00:00

9	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 2** Duration: 02:00 Laboratory assignments		
10	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 2** Duration: 02:00 Laboratory assignments		
11	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 2** Duration: 02:00 Laboratory assignments		
12	**Unit 5** Duration: 02:00 Lecture	**Laboratory - Practice 2** Duration: 02:00 Laboratory assignments		**Fourth CourseWork** Individual work Continuous assessment Duration: 00:00
13				
14				
15				
16				
17				**Final Exam** Written test Continuous assessment Duration: 03:00 **Final Exam** Written test Final examination Duration: 03:00

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The subject schedule is based on a previous theorical planning of the subject plan and might go to through experience some unexpected changes along throughout the academic year.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
4	Partial continuous assessment	Individual work	Face-to-face	02:00	10%	5 / 10	CG7 CB7 CT3 CT7 CB8 CB6 CG4
5	First CourseWork	Group work	No Presential	00:00	5%	5 / 10	CG7 CG3 CT3 CT5 CE1 CT7 CB8 CB6 CG2 CG10 CT1 CE7 CE8 CT2
8	Second CourseWork	Individual work	No Presential	02:00	15%	5 / 10	CB7 CB10 CT3 CT7 CB8 CG7 CG3 CB6 CG2 CG4 CB9 CG5 CE8 CE4

8	Third CourseWork	Group work	No Presential	00:00	5%	5 / 10	CG7 CG3 CT3 CT5 CE1 CT7 CB8 CB6 CG2 CG10 CT1 CE7 CE8 CE4
12	Fourth CourseWork	Individual work	No Presential	00:00	15%	5 / 10	CG7 CG8 CG3 CB7 CB10 CT3 CT7 CB8 CB6 CG2 CG4 CB9 CG5 CE8 CE4
17	Final Exam	Written test	Face-to-face	03:00	50%	5 / 10	CG7 CB7 CG1 CT4 CB8 CG5 CG10

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final Exam	Written test	Face-to-face	03:00	100%	5 / 10	CG7 CG8 CG3 CB7 CG1 CB10 CT3 CT4 CT5 CE1 CT7 CB8 CB6

							CG2 CG4 CB9 CG5 CG10 CT1 CE7 CE8 CT2 CE4

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

Continuous assessment:

- Partial continuous assessment. Weight: 10% of the final mark. A minimum mark of 4 points out of 10 is needed to pass the subject. It will consist in short questions, demonstrations, practical cases and/or numerical exercises that the students will solve and deliver to their professor.
- CourseWorks. Weight: 40% of the final mark. A minimum mark of 4 points out of 10 is needed to pass the subject. The practices are not saved for later courses. The final mark is obtained by weighting each one of the CourseWorks marks according to the percentages foreseen in the evaluation activities section.
- Final individual test. Weight: 50% of the final mark. A minimum mark of 5 points out of 10 is needed to pass the subject. It consists in an individual written test that will contain short questions, demonstrations, practical cases and/or numerical exercises. There will also be an individual test that will be done by computer consisting of: practical cases similar to those made in the laboratory. There is the possibility of compensating the exam mark as long as it is not less than 4 points.

Evaluation by final test:

- The criteria indicated below will also be valid for extraordinary calls.
- Only a written exam will be held, which may short questions, demonstrations, practical cases and/or numerical exercises. There will also be an individual test that will be done by computer consisting of: practical cases similar to those made in the laboratory. A minimum mark of 5 points out of 10 is needed to pass the subject.
- The completion of practices and the delivery of results is mandatory. It will be essential to obtain a minimum mark of 5 points out of 10 in the practices.

Procedure for the renounce to continuous assessment:

- Students who wish to renounce continuous assessment must do so within the deadlines stipulated in each academic year. They must do so by writing to the coordinator of the subject (Prof. Jesús Caja), and present it in the Registry of the Departamento de Ingeniería Mecánica, Química y Diseño Industrial.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Advanced Modeling and Optimization of Manufacturing Processes. Venkata Rao, R. Springer. 1ª Edición. 2011.	Bibliography	
Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection: A Handbook for Geometrical Product Specification using ISO and ASME Standards. Henzold, Georg. Elsevier Ltd. 2ª Edición. 2006.	Bibliography	

Interpretation of Geometric Dimensioning and Tolerancing. Puncochar, Daniel E. Industrial Press, Inc. 3ª Edición. 2011.	Bibliography	
Computer-aided manufacturing. Chang , T.C. et al. Pearson Prentice Hall. 3ª Edición. 2006.	Bibliography	
Computer Integrated Manufacturing and Engineering. Rembold, Ulrich et al. Addison Wesley Longman Inc Div Pearson. 1ª Edición. 1993.	Bibliography	
Diseño Y Fabricación Con Catia V5 - Módulos CAM. Garijo Gomez, Egbert . Dies. 1ª Edición. 2012.	Bibliography	
CAD/CAM mit CATIA V5. NC-Programmierung, Postprocessing, Simulation. Hoffmann, Michael et al. Carl Hanser Verlag GmbH & Co. KG. 2ª Edición. 2010.	Bibliography	
ISO standards, GPS series (Geometrical product specifications)	Bibliography	
PGDnet (Teaching management platform through internet)	Web resource	http://www.etsidi.com/pgdnet
Equipment of the Mechanical Manufacturing Laboratory (A-107)	Equipment	
Equipment of the EG1 and EG2 Laboratories	Equipment	