ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

563000071 - Design And Manufacturing Based On Assembly

DEGREE PROGRAMME

56AC - Master Universitario En Ingenieria En Diseño Industrial

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	563000071 - Design And Manufacturing Based On Assembly
No of credits	4.5 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	56AC - Master Universitario en Ingenieria en Diseño Industrial
Centre	56 - E.T.S. De Ingeniería Y Diseño Industrial
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Roque Calvo Iranzo (Subject coordinator)	B -150-3	roque.calvo@upm.es	Sin horario. Tutorships are scheduled at the begininig of the course.
Piera Maresca	B -148	piera.maresca@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

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- English

4. Skills and learning outcomes *

4.1. Skills to be learned

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

CE2 - Capacidad de gestionar el ciclo de vida del producto

CE3 - Capacidad de aplicar los conceptos innovadores de las nuevas tendencias en los diseños de producto

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

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

4.2. Learning outcomes

RA180 - Conocimiento de las técnicas actuales de mejora de sistemas de fabricación para la competitividad, aplicadas a istemas de montaje industrial.

RA181 - Conocimiento de técnicas de simulación de sistemas de fabricación, como herramienta de análisis para la mejora o investigación.

RA178 - Conocimiento de las alternativas de procesos de unión y montaje aplicables en relación al diseño del producto.

RA182 - Capacidad para analizar las alternbativas y restricciones en el diseño de producto desde la fabricación basada en montaje.

RA179 - Capacidad de análisis operativo integrado para la toma de decisiones en contexto de ciclo de vida sobre el desarrollo de producto, en sus fases de diseño y fabricación industriales basados en montaje.

RA184 - Contribución desde la formación al ODS 12: "Garantizar modalidades de consumo y producción sostenibles"

RA185 - Contribute from education to ODS Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation

* 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

A topic selection on mechanical assemblies, joining processes, design and manufacturing tolerances are studied in relationship with their use in the design and development of products. The integration of manual and automated assembly processes into manufacturing systems, together with the economic and sustainability implications in product development and product life cycle are also analysed.

5.2. Syllabus

1. Assembly in development and manufacturing of products
    1.1. Historic perspective
    1.2. Variety, personalization and modularity in design and manufacturing
    1.3. Supply chain
    1.4. Concurrent engineering in design and manufacturing
2. Assembly and joining advanced processes
    2.1. Classification of assembly and joining processes. Classic processes.
    2.2. Integral mechanical joins
    2.3. Adhesive joins
    2.4. Robotic and automated assembly
3. Design development for assembly
    3.1. Tolerance analysis for assembly
    3.2. Assembly and disassembly sequencing
4. Assembly manufacturing systems
    4.1. Selection and integration of mechanical manufacturing processes
    4.2. The assembly process
    4.3. Design for manufacturing and assembly (DFMA)
    4.4. Product development for disassembly and recycling
    4.5. Design of the assembly system

4.6. Assembly system operations

4.7. Improvement of assembly systems: lean manufacturing

4.8. Economic analysis of assembly systems.

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Topic 1** Duration: 03:30 Lecture			
2	**Topic 1** Duration: 03:30 Lecture			
3	**Topic 2** Duration: 02:30 Lecture **Cooperative actions and problems** Duration: 01:00 Problem-solving class			
4	**Topic 2** Duration: 02:30 Lecture **Cooperative actions and problems** Duration: 01:00 Cooperative activities			
5	**Topic 2** Duration: 03:30 Lecture			
6	**Topic 3** Duration: 03:30 Lecture			
7	**Practice** Duration: 03:30 Laboratory assignments			
8	**Topic 4** Duration: 03:30 Lecture			
9	**Topic 4** Duration: 02:30 Lecture **Cooperative actions and problems** Duration: 01:00 Cooperative activities			
10	**Topic 4** Duration: 02:30 Lecture **Cooperative actions and problems** Duration: 01:00 Problem-solving class			

11	**Topic 4** Duration: 01:00 Lecture **Practice** Duration: 02:30 Problem-solving class			**Individual project - Delivery** Other assessment Progressive assessment Presential Duration: 00:00
12	**Team project presentation** Duration: 03:30 Additional activities			**Team project presentation** Group presentation Progressive assessment Presential Duration: 03:30
13				**Global exam** Written test Progressive assessment and Global Examination Presential Duration: 03:00
14				
15				
16				
17				

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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
11	Individual project - Delivery	Other assessment	Face-to-face	00:00	20%	0 / 10	CE2 CG4 CG5 CG7 CB6 CE3
12	Team project presentation	Group presentation	Face-to-face	03:30	30%	0 / 10	CE2 CG4 CG5 CE3 CG1 CG7 CB6
13	Global exam	Written test	Face-to-face	03:00	50%	4 / 10	CG1 CG7 CB6 CE2 CG4 CG5 CE3

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
13	Global exam	Written test	Face-to-face	03:00	50%	4 / 10	CG1 CG7 CB6 CE2 CG4 CG5 CE3

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary call: 80% exam + 20% Individual Project	Other assessment	Face-to-face	03:00	100%	5 / 10	CG7 CG1 CB6 CE2 CG4 CG5 CE3

7.2. Assessment criteria

1. ORDINARY CALL

Through Progressive Assessment

Three contributions to the grade:

a. Individual Project. It weighs 20% of the final grade. Topic, formats, date of delivery and rules will be established by the coordinator at the beginning of the course.

b. Team Project. It weighs 30% of the final grade. Team composition, topic, formats, date of delivery or presentation, and other details will be established by the coordinator at the beginning of the course.

c. Global test. It weighs 50% of the final grade. It is an individual written exam with theory, problems, applications, cases, etc. on the overall content of the course. The minimum score in the global test (c) will be 4/10 in order to average the scores of the 3 contributions (a,,b,,c), otherwise it will not be averaged the global test together with the projects scores, and the final grade in the ordinary call will be that of the global test.

2. EXTRAORDINARY CALL

In the extraordinary call of exams, the assessment will be through a written final exam that weighs 80% and the grade of the Individual Project 20%. The minimum score in the exam must be 4/10 in order to average the score with the Induvidual Project score. Otherwise the final grade in the extraordinary call will be that of the exam.

To pass 5/10 points or over are necessary in the weighted average to pass.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
WHITNEY, D.E.,"Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development", New York, Oxford University Press, 2004.	Bibliography	
BOOTHROYD, G. "Assembly Automation and product Design", Taylor & Francis, 2005.	Bibliography	
GROOVER, M. P., "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall, Londres, 2000.	Bibliography	

CHASE, R.B., AUILANO, N. J., JACOBS, F.R., Production and operations management: manufacturing and services, Irwin/McGraw-Hill, 1998	Bibliography	
KALPAKJIAN, S., SCHMID, S., "Manufacturing Engineering and Technology", 7th ed., Pearson Education Inc. , 2014.	Bibliography	
THOMPSON, R., "Manufacturing Processes for Design Professionals " Thames & Hudson Ltd, London, 2007	Bibliography	
www.sme.org	Web resource	
www.asme.org	Web resource	
www.idsa.org	Web resource	
www.icsid.org	Web resource	
www.beda.org	Web resource	
www.ico-d.org	Web resource	
www.ecodesign-centres.org	Web resource	
Laboratorio de fabricación mecánica (manufacturing engineering lab)	Equipment	

9. Other information

9.1. Other information about the subject

This course contributes from Higher Education imprint and ulterior professional exercice to the Sustainable Development Goals (SDG) by United Nations (UN):

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

SDG 12: Ensure sustainable consumption and production patterns.