[GMG301] DEVELOPMENT TECHNOLOGY

GENERAL INFORMATION

Studies	DEGREE IN MECHANICAL ENGINEERING			**Subject**	MANUFACTURING PROCESS ENGINEERING
Semester	1	**Course**	2	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	CASTELLANO/EUSKARA
Credits	4,5	**Hours/week**	3.78	**Total hours**	68 class hours + 44.5 non-class hours = **112.5 total hours**

PROFESSORS

GARCIA CRESPO, CARLOS
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TRINIDAD NARANJO, JAVIER

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
GRAPHIC EXPRESSION I GRAPHIC EXPRESSION II	Basic concepts of mathematics: Geometry, tigonometry, interpolation, extrapolation... Basic concepts of physics: pressure, units...

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GMR207 - To demonstrate basic knowledge of production and manufacturing systems	x			4,02
G-RTR1 - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and /or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,24
G-RTR2 - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,24
			Total:	4,5

KC: Knowledge or Content / SK: Skills / AB: Abilities

ENAEE LEARNING RESULTS

ENA102 - Knowledge and comprehension: Knowledge and comprehension of the engineering disciplines of their speciality, at the level necessary to acquire the rest of the competencies of the degree, including notions of the latest advances.

ENA103 - Knowledge and comprehension: Awareness of the multidisciplinary context of engineering.

ENA104 - Analysis in engineering: The ability to analyse complex products, processes and systems in their field of study; choose and apply relevant analytical, calculation and experimental methods in a suitable way; and correctly interpret the results of such analyses.

ENA106 - Engineering projects: Ability to project, design and develop complex products (parts, components, finished products, etc.), processes and systems of their speciality, which meet the established requirements, including awareness of the social, health and safety, environmental, economic and industrial aspects, as well as selecting and applying appropriate project methods.

ENA109 - Research and innovation: Ability to consult and apply codes of good practice and security in their speciality.

ENA111 - Practical application of engineering: Understanding of the applicable techniques and methods fr analysis, design and research and their limitations in the field of their speciality.

ENA113 - Practical application of engineering: Knowledge of application of materials, equipment and tools, engineering technology and processes, and their limitations in the field of their speciality.

ENA118 - Preparation of judgements: Ability to manage complex technical or professional activities or projects of their speciality, taking responsibility for decision making.

ENA119 - Communication and Teamwork: Ability to effectively communicate information, ideas, problems and solutions in the field of engineering and with society in general.

ENA120 - Communication and Teamwork: Ability to operate effectively in domestic and international contexts, individually and as a team, and to cooperate with both engineers and people from other disciplines.

SECONDARY LEARNING RESULTS

RGM290 **[!]** ***Proponer los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías propias de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrategia de aprendiz***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	1 h.	1 h.	2 h.

Tutoring sessions and monitoring of training activities	1 h.	1 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	85%	*(No mechanisms)*
Observation (technical capacity, attitude and participation)	15%	

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RGM291 **[!]** ***Establecer las responsabilidades de los miembros del equipo utilizando técnicas adecuadas para fomentar la eficiencia del equipo para el desarrollo del proyecto en los plazos establecidos (compartir recursos, aportar ideas, habilidades comunicativas***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	1 h.	1 h.	2 h.
Tutoring sessions and monitoring of training activities	1 h.		1 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	20%	*(No mechanisms)*
Self-assessment	50%	
Observation (technical capacity, attitude and participation)	30%	

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RGM293 **[!]** ***Redacta y estructura correctamente la memoria del proyecto, haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje. Para ello, busca y hace uso de las fuentes de información adecuadas.***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	1 h.	1 h.	2 h.
Tutoring sessions and monitoring of training activities	1 h.		1 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RGM294 **[!]** ***Realiza una presentación oral del proyecto con argumentos elaborados por sí mismos y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.***

LEARNING ACTIVITIES	CH	NCH	TH

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	1 h.	1 h.	2 h.
Tutoring sessions and monitoring of training activities	1 h.		1 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	50%	*(No mechanisms)*
Observation (technical capacity, attitude and participation)	50%	

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RGM222 **[!]** ***Identifica y dimensiona la maquinaria, útiles, herramientas y parámetros de trabajo de varios procesos de fabricación***

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	4 h.		4 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	29 h.	7 h.	36 h.
Carrying out exercises and solving problems individually and/or in teams	7 h.	4 h.	11 h.
Practical work in workshops and/or laboratories, individually and/or in teams	4 h.		4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 44 h.
NCH - Non-class hours: 11 h.
TH - Total hours: 55 h.

RGM223 **[!]** ***Define el proceso de fabricación principal para una pieza dada***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		23 h.	23 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.		2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 2 h.
NCH - Non-class hours: 23 h.
TH - Total hours: 25 h.

RGM224 **[!]** ***Ser capaz de diseñar procesos de fabricación para determinadas piezas, conjugando criterios tecnológicos y económicos***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	12 h.	6,5 h.	18,5 h.
Tutoring sessions and monitoring of training activities	2 h.		2 h.

EVALUATION SYSTEM	W
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	50%
Individual written and/or oral tests or individual coding/programming tests	50%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 14 h.
NCH - Non-class hours: 6,5 h.
TH - Total hours: 20,5 h.

CONTENTS

0.- Manufacturing technologies: Introduction

1.- Casting processes

1.1.- Fundamentals of casting processes

1.2.- Permanent mold processes

1.3.- Non-permanent mold processes

1.4.- Special processes

1.5.- Basic concepts of mold design

2.- Forging

2.1.- Bases of the forging process

2.2.- Open die forging

2.3.- Closed die forging

2.4.- Design of dies for forging

3.- Sheet metal forming processes

3.1.- Fundamentals of cutting processes

3.2.- Fundamentals of bending processes

3.3.- Cylindrical deep drawing

4.- Welding

4.1.- Fundamentals of welding

4.2.- Fusion welding

- Oxyazethylene welding

- Electric arc welding with coated electrode

- MIG/MAG welding

- TIG welding

- Resistance welding

4.3.- Solid state welding

- Friction welding

5.- Plastic transformation processes

5.1.- Injection process

- Introduction to injection mold design

5.2.- Extrusion process

5.3.- Blowing processes

5.4.- Thermoforming

5.5- Compression process

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes Moodle Platform Class presentations Video projections Labs	Mikell P Groover Fundamentals of modern manufacturing Materials, Processes, and Systems, 7 th Edition Wiley Sons 2019 (ISBN 978-1-119-47521-7) Manufactura Ingeniería y Tecnología Kalpakjian Schmid PRENTICE HALL (ISBN 970-2b-0137-1) ASM Handbook. Vol.15: Casting ISBN electronic: 978-1-62708-187-0 Complete Casting Handbook. John Campbell ISBN: 978-0-081-00120-2 Menges Georg, Michaeli Walter, Mohren Paul. How to Make Injection Molds (3rd Edition). Hanser Publishers; 2001. ISBN: 978-3-446-40180-8 / 978-3-446-21256-5