

[GMF301] INTRODUCTION TO MECHANICAL DESIGN

GENERAL INFORMATION

Studies	DEGREE IN MECHANICAL ENGINEERING		Subject	DESIGN & TESTING OF MACHINES
Semester	2	Course	2	Mention / Field of specialisation
Character	COMPULSORY		Language	CASTELLANO/EUSKARA
Plan	2022	Modality	Face-to-face	Total hours
Credits	6	Hours/week	4.89	88 class hours + 62 non-class hours = 150 total hours

PROFESSORS

EZPELETA LASCURAIN, IÑIGO
GARCIA ABAUNZ, MIKEL
AGINAGALDE LOPEZ, ANDREA
TRINIDAD NARANJO, JAVIER
INSAUSTI GARMENDIA, OLATZ

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
PHYSICS I	(No previous knowledge required)
GRAPHIC EXPRESSION I	
GRAPHIC EXPRESSION II	
MATERIALS SCIENCE FOUNDATIONS	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GMR208 - To demonstrate knowledge and ability to calculate, design and test machines		x		5,4
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		0,32
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		0,28
Total:				6

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

ENAE 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.
- ENA105** - Analysis in engineering: The ability to identify, formulate and solve engineering problems in their speciality; choose and apply adequately established analytical, calculation and experimental methods; and acknowledge the importance of social, health and safety, environmental, economic, and industrial restrictions.
- 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.
- ENA110** - Research and innovation: Capacity and ability to project and carry out experimental investigations, interpret results, and reach conclusions in their field of study.
- ENA111** - Practical application of engineering: Understanding of the applicable techniques and methods for analysis, design and research and their limitations in the field of their speciality.
- ENA112** - Practical application of engineering: Practical competency to solve complex problems, carry out complex engineering projects, and conduct investigations specific to 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.
- ENA114** - Practical application of engineering: Ability to apply standards of engineering practice in their speciality.
- ENA115** - Practical application of engineering: Knowledge of the social, health and safety, environmental, economic and industrial implications of engineering practice.
- 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

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	2 h.	2 h.	4 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%
Co-assessment	50%

Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals. The average of the marks of the tutor's assessment and the self-assessment carried out by the work team is calculated, using the defined rubrics. Afterwards, the final mark is calculated by multiplying the average mark by a factor calculated on the basis of the co-evaluation among the members of the group.

MAKE-UP MECHANISMS

(No mechanisms)
Comments: The evaluation of the semester project will be continuous and will be based on the meetings of the team with the tutor and the experts. One week before the final delivery of the report, the work as a whole will be analysed, the necessary improvements will be defined and communicated to the team. Improvements must be made before the delivery of the final version of the report.

CH - Class hours: 2 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 4 h.

RGM227 [!] *Valora las posibles alternativas respecto al subconjunto mecánico a diseñar y representa el más apropiado, integrando elementos mecánicos comerciales*

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	11 h.	9,5 h.	20,5 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 h.
Carrying out exercises and solving problems individually and/or in teams	33 h.	22 h.	55 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	20%
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	70%
Individual written and/or oral tests or individual coding/programming tests	10%

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
 Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 47 h.
NCH - Non-class hours: 31,5 h.
TH - Total hours: 78,5 h.

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		2 h.	2 h.	4 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%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Comments: The evaluation of the semester project will be continuous and will be based on the meetings of the team with the tutor and the experts. One week before the final delivery of the report, the work as a whole will be analysed, the necessary improvements will be defined and communicated to the team. Improvements must be made before the delivery of the final version of the report		
CH - Class hours: 2 h. NCH - Non-class hours: 2 h. TH - Total hours: 4 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		2 h.	2 h.	4 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) Comments: The evaluation of the semester project will be continuous and will be based on the meetings of the team with the tutor and the experts. One week before the final delivery of the report, the work as a whole will be analysed, the necessary improvements will be defined and communicated to the team. Improvements must be made before the delivery of the final version of the report.		
Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.				
CH - Class hours: 2 h. NCH - Non-class hours: 2 h. TH - Total hours: 4 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
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.	2 h.	3 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	100%	(No mechanisms) Comments: The evaluation of the semester project will be continuous and will be based on the meetings of the team with the tutor and the experts. One week before the final delivery of the report, the work as a whole will be analysed, the necessary improvements will be defined and communicated to the team. Improvements must be made before the delivery of the final version of the report.		
Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.				

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

RGM226 [!] *Efectúa una representación correcta de los componentes mecánicos indicando los requisitos dimensionales, superficiales y geométricos que garantizarán su funcionamiento en el conjunto así como el material adecuado para la aplicación*

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	7 h.	6,5 h.	13,5 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 h.
Carrying out exercises and solving problems individually and/or in teams	24 h.	16 h.	40 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	70%	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
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	20%	Individual written and/or oral tests or individual coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	10%	

Comments: It is essential to pass the individual written test

CH - Class hours: 34 h.
NCH - Non-class hours: 22,5 h.
TH - Total hours: 56,5 h.

CONTENTS

1. ASSEMBLY DRAWINGS AND EXPLODED VIEWS (REVIEW) 1.1. Analysis of a mechanical assembly (fittings, mechanical elements, materials). 1.2. Develop 3D/2D drawings with their dimensional, surface and geometric tolerances. 2. TOOLING DESIGN 2.1. Transfer machines 2.2. Detailed design of tooling (selection of commercial elements, representation of 2D/3D drawings of assemblies and offsets) 3. BEARINGS 3.1. Types of bearings 3.2. Bearing Selection Criteria 3.3. Bearing design analysis 3.4. Development of a design containing bearings 4. SEMESTER PROJECT 4.1. Based on the technical product specifications design a mechanical sub-assembly and write a technical report (specification notebook, development of design concepts/alternatives, assembly and lay-out drawings, selection of materials, manufacturing processes). Translated with www.DeepL.com/Translator (free version)

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	JENSEN, Cecil H. Geometric Dimensioning & Tolerancing. Delmar Publishing, 1992
Class presentations	GRANT, Hiram E. Jigs and Fixtures. McGraw Hill, 1967
Topic related web quires	MATUSZEWSKI, h. Handbuch Vorrichtungen: Konstruktion und Einsatz. Vieweg 1986
Moodle Platform	BERTOLINE-WIEBE-MILLER-MOHLER. Dibujo en Ingeniería y Comunicación Gráfica. McGraw Hill, 1999
Specific Master Software	COGORNÓ, R. Cogorno. Geometric Dimensioning and Tolerancing. McGraw-Hill, 2003
	FÉLEZ, Jesús; MARTINEZ M. ^a Luisa. Ingeniería Gráfica y Diseño. Editorial Síntesis, 2008
	CHILDS, Peter R.N. Mechanical Design Engineering Handbook.

Elsevier, 2014 [Online Biblioteca MGEP]

VENKATARAMAN, K. Design of Jigs, Fixtures and Press Tools.
Wiley, 2015

X. DISEINUA. FABRIKAZIO TRESNERIA. Elhuyar, 2002 [Online
Biblioteca MGEP]