[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				
Plan	2022	**Modality**	Face-to-face	**Language**	EUSKARA/CASTELLANO
Credits	6	**Hours/week**	4.89	**Total hours**	88 class hours + 62 non-class hours = **150 total hours**

2030 AGENDA GOALS

PROFESSORS

EZPELETA LASCURAIN, IÑIGO
GARCIA ABAUNZ, MIKEL
AGINAGALDE LOPEZ, ANDREA
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		0,36
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:	6

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.

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 fr 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

2RGM293 **(2 sem)**

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	1,5 h.	1,5 h.	3 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

CH - Class hours: 1,5 h.
NCH - Non-class hours: 1,5 h.
TH - Total hours: 3 h.

2RGM294 **(2 sem)**

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
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%

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

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

Comments: The updated version of SolidWorks is used to carry out the design exercises. Use of updated catalogues

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies,	20%

MAKE-UP MECHANISMS

Presentation and defence of exercises, case studies, computer

computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems		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	70%	Individual written and/or oral tests or individual coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	10%	

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

2RGM291 (2 sem)

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	1,5 h.	1,5 h.	3 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: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings 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: 1,5 h.
NCH - Non-class hours: 1,5 h.
TH - Total hours: 3 h.

2RGM292 (2 sem)

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	1,5 h.	1,5 h.	3 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: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings 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: 1,5 h.
NCH - Non-class hours: 1,5 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.

Comments: The updated version of SolidWorks is used to carry out the design exercises.

EVALUATION SYSTEM	W
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	20%
Individual written and/or oral tests or individual coding/programming tests	10%

Comments: It is essential to pass the individual written test

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

2RGM290 **(2 sem)**

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	1,5 h.	1,5 h.	3 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings

CH - Class hours: 1,5 h.
NCH - Non-class hours: 1,5 h.
TH - Total hours: 3 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 bearings4. 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

Subject notes
Class presentations
Topic related web quires
Moodle Platform
Specific Master Software

Bibliography

JENSEN, Cecil H. Geometric Dimensioning & Tolerancing. Delmar Publishing, 1992

GRANT, Hiram E. Jigs and Fixtures. McGraw Hill, 1967

MATUSZEWSKI, h. Handbuch Vorrichtungen: Konstruktion und Einsatz. Vieweg 1986

BERTOLINE-WIEBE-MILLER-MOHLER. Dibujo en Ingeniería y Comunicación Gráfica. McGraw Hill, 1999

COGORNO, 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

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