[GMJ301] FLUID MECHANICS

GENERAL INFORMATION

Studies	DEGREE IN MECHANICAL ENGINEERING	**Subject**	FLOW ENGINEERING
Semester	2	**Course**	2
Character	COMPULSORY	**Mention / Field of specialisation**	
Plan	2022	**Modality**	Face-to-face
Language	EUSKARA/CASTELLANO		
Credits	4,5	**Hours/week**	4
Total hours	72.02 class hours + 40.48 non-class hours = **112.5 total hours**		

2030 AGENDA GOALS

PROFESSORS

ERRARTE YARZA, ANE
ALONSO DE MEZQUIA GONZALEZ, DAVID
AIZPURU SULIS, JON

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
MATHEMATICS I	*(No previous knowledge required)*
MATHEMATICS II	
PHYSICS I	
MECHANICS	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GMR209 - To know the basic principles of fluid mechanics. Calculation of pipes, channels and fluid 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		0,32
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		0,16
			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.

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.

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

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	1,34 h.	,66 h.	2 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 in the project follow-up meetings.

CH - Class hours: 1,34 h.
NCH - Non-class hours: ,66 h.
TH - Total hours: 2 h.

2RGM294 (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	1,34 h.	,66 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	100%

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

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

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

CH - Class hours: 1,34 h.
NCH - Non-class hours: ,66 h.
TH - Total hours: 2 h.

RGM228 [!] *Identificar las propiedades de los fluidos y analizar su coportamiento hidrostático, y conocer los métodos de análisis de la estática de fluidos tanto en el entorno teórico como en el práctico*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	8 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	14 h.		14 h.
Carrying out exercises and solving problems individually and/or in teams	6 h.	7 h.	13 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	20%
Individual written and/or oral tests or individual coding/programming tests	70%
Observation (technical capacity, attitude and participation)	10%

Comments: Students have the responsability of meeting the experts to do the tracking of the project and to ensure the achievement of the goals.

MAKE-UP MECHANISMS

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

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

CH - Class hours: 22 h.
NCH - Non-class hours: 15 h.

TH - Total hours: 37 h.

RGM229 **[!]** ***Analizar el comportamiento hidrodinámico de los fluidos viscosos utilizando métodos analíticos, análisis adimensional, teoria de modelos y aplicarlos a diferentes entornos teóricos y prácticos***

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	9 h.	9 h.	18 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	1,5 h.	3,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	24 h.		24 h.
Carrying out exercises and solving problems individually and/or in teams	7 h.	11 h.	18 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	70%
Individual written and/or oral tests or individual coding/programming tests	20%
Observation (technical capacity, attitude and participation)	10%

Comments: Students have the responsability of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.

MAKE-UP MECHANISMS

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: 42 h.
NCH - Non-class hours: 21,5 h.
TH - Total hours: 63,5 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	2 h.	1 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%
Self-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

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

Comments: Continuous evaluation and feedback of the semi-annual project

CH - Class hours: 2 h.
NCH - Non-class hours: 1 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	1,34 h.	,66 h.	2 h.

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

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

Comments: Continuous evaluation and feedback of the semi-annual project

CH - Class hours: 1,34 h.
NCH - Non-class hours: ,66 h.
TH - Total hours: 2 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	2 h.	1 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 in the project follow-up meetings

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

CONTENTS

TOPIC I: INTRODUCTION TO FLUID MECHANICS

TOPIC II: PHYSICAL PROPERTIES OF FLUIDS

TOPIC III: HYDROSTATICS

TOPIC IV: HYDRODYNAMICS

TOPIC V: DIMENSIONLESS METHOD AND SIMILARITY

TOPIC VI: TURBOMACHINES

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Student book
Slides of the subject
Moodle Platform

Bibliography

Mecánica de fluidos; F. M. White; Mac Graw Hill, 1988
Mecánica de fluidos: Fundamentos y aplicaciones; Y. Cengel, J. Cimbala; Mac Graw Hill, 2020

Video projections	Fluidos, Bombas e instalaciones hidráulicas; S. de las Heras, UPCGrau,2011 Mecánica de fluidos aplicada; R. L. Mott; Prentice Hall, 1996 Mecánica de fluidos y máquinas hidráulicas; C. Mataix; Castillo Arg., Madril, 1997. Mecánica de fluidos; J. B. Franzini, E. J. Finnemore; Mac Graw Hill, 1999. Mecánica de fluidos incompresibles y turbomáquinas hidráulicas; J. Agüera Soriano; Ciencia 3 Arg., Madril, 1996 Mecánica de fluidos; V. L. Streeter, E. B. Wylie, K. W. Bedford; Mc Graw Hill, 1999. Mecánica vectorial para ingenieros: Dinámica; P. Ferdinand; Mc Graw Hill, 2010. Mecánica de fluidos; I. H. Shames, Mc Graw Hill, 1995 Introducción a la mecánica de fluidos; R. W. Fox, A. T. McDonald, McGraw Hill, 1997 Ingeniería Fluidomecánica; N. García Tapia, Universidad de Valladolid, Valladolid, 1998 Aire comprimido: Teoría y cálculo de las instalaciones; E. Carnicer, Paraninfo, Madrid, 1990 Neumática básica. Training neumático; B. Hasenbrink, Mannesmann Rexroth 1991 Física universitaria; F. W. Sears, M. W. Zemansky, H. D. Young; Addison-Wesley Iberoamericana La génesis de la mécanica de fluidos; J. S. Calero; UNED, Madril, 1996 Jariakin konprimaezinen mekanika eta turbomakina hidraulikoak; J. Agüera Soriano; EHU/UPV-ko argitalpen zerbitzua, Bilbo, 1994 Fluidoen fluxua eta bero-trukea ingeniaritzan; O. Levenspiel; EHU/UPV-ko argitalpen zerbitzua, Bilbo, 2009 Fisika zientzialari eta ingeniarientzat; P. M. Fishbane, S. Gasiorowicz, S. T. Thornton, EHU-ko argitalpen zerbitzua, 2008. Fisika Orokorra; UEU-ko Fisika saila; Udako Euskal Unibertsitatea, Bilbo, 1992 Forma eta fluxua. Arrastearen fluido-dinamika; A. H. Shapiro, Itzul.: J. R. Etxebarria, J. M. Igartua, J. I. Urresti; Udako Euskal Unibertsitatea, Bilbo, 2000.