UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course:	FLUIDS ENGINEERING	**Code:**	310625
Type:	CORE COURSE	**ECTS credits:**	6
Degree:	2338 - MASTERS DEGREE PROGRAMME IN INDUSTRIAL ENGINEERING (AB)	**Academic year:**	2023-24
Center:	605 - SCHOOL OF INDUSTRIAL ENGINEERS. AB	**Group(s):**	10 11
Year:	1	**Duration:**	C2
Main language:	English	**Second language:**	Spanish
Use of additional languages:		**English Friendly:**	N
Web site:		**Bilingual:**	Y

Lecturer: **JUAN IGNACIO CORCOLES TENDERO** - Group(s): **10 11**

Building/Office	Department	Phone number	Email	Office hours
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2. Pre-Requisites

It is required that the student has a basic knowledge of Fluid Mechanics acquired during Industrial Engineering degree or equivalent. Basic knowledge of Physics, Algebra and Calculus is also required.

3. Justification in the curriculum, relation to other subjects and to the profession

The course provides the basic knowledge and skills for the study of viscous fluids and turbulent flows using simple mathematical models which are applied in real situations. Therefore it is important the use of differential equations as well as basic knowledge in classical mechanic and fluid mechanics. To develop these models some assumptions about the problem must be carried out, as well as to analyze whether the model is useful to explain phenomena observed in laboratory. Fluid Mechanics is vast and covers a broad range of modern technologies, such as the design of fluid machinery.Indeed, it is an important branch of classical physics which is related to several technological fields and with some relevant challenges, such as the problem of turbulence. It is a basic and fundamental subject because it is applied in many fields within Natural Sciences and Engineering: astronomy, aerodynamic, propulsion, combustion, biofluids, meteorology, oceanography, hydraulic, acoustics, nanotechnology and turbulent flows, etc.

4. Degree competences achieved in this course

Course competences

Code	Description
A01	To have appropriate knowledge of the scientific and technological aspects of mathematical, analytical and numerical methods in engineering, electrical engineering, energy engineering, chemical engineering, mechanical engineering, continuous medium mechanics industrial electronics, automation, manufacturing, materials, quantitative management methods, industrial computing, town planning, infrastructures, etc.
A03	To lead, plan and supervise multidisciplinary teams.
B05	Knowledge and skills for the design and analysis of machines and heat engines, hydraulic machinery, and industrial heating and cooling installations
CB06	Knowledge and skills to organise and manage enterprises.
CB07	Strategy and planning knowledge and skills applied to different organisational structures.
CB08	Knowledge of commercial and labour law.
CB10	Knowledge of information systems for management, industrial organisation, production, logistics and quality management systems.
D04	Knowledge and abilities to plan and design electrical and fluid installations, lighting, heating and ventilation, energy saving and efficiency, acoustics, communications, domotics, Smart buildings and security installations.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Construct simple models to describe viscous flows near solid walls.

Additional outcomes

Create models to describe the flow of viscous fluids and compressible flows.
Solve problems of viscous flows.
Simulate fluid flows using Computational Fluid Dynamics

6. Units / Contents

Unit 1: General Concepts. Fluid properties.

Unit 2: Fluid Kinematics

Unit 3: Fundamental Equations in integral form

Unit 4: Differential equations in Fluid Mechanics

Unit 4.1 Introduction to Computational Fluid Dynamics. Computational Simulation

Unit 5: Hydraulic Transients

Unit 6: Incompressible External Flow

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	A01 CB06 CB07 CB08	0.8	20	N	-	Theoretical Explanations
Class Attendance (theory) [ON-SITE]	Problem solving and exercises	A01 B05 CB06 CB07 CB08 CB10 D04	0.2	5	N	-	Problems
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A01 B05 CB06 CB07 CB08 CB10 D04	0.4	10	N	-	Problems
Group tutoring sessions [ON-SITE]	Group tutoring sessions	A01 CB07 CB08 CB10	0.2	5	N	-	Group tutoring
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A01 A03 CB06 CB07 CB08 CB10	0.4	10	N	-	Practice
Workshops or seminars [ON-SITE]	Workshops and Seminars	A01 CB06 CB07 CB08 CB10	0.2	5	N	-	Seminar
Progress test [ON-SITE]	Assessment tests	A01 A03 B05 CB06 CB07 CB08 CB10 D04	0.1	2.5	Y	Y	Partial exam
Final test [ON-SITE]	Assessment tests	A01 A03 B05 CB06 CB07 CB08 CB10 D04	0.1	2.5	Y	Y	Exam
Off-site theoretical learning [OFF-SITE]	Group tutoring sessions	A01 CB07 CB08 CB10	0.32	8	N	-	Group tutoring
Practicum and practical activities report writing or preparation [OFF-SITE]	Self-study	A01 CB06 CB07 CB08 CB10	0.4	10	Y	N	Practice report
Writing of reports or projects [OFF-SITE]	Self-study	A01 CB06 CB07 CB08 CB10	0.48	12	Y	N	Report
Study and Exam Preparation [OFF-SITE]	Self-study	A01 CB07 CB08 CB10	2.4	60	N	-	Self Study
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Mid-term tests	30.00%	0.00%	Partial exam
Practicum and practical activities reports assessment	20.00%	20.00%	Practices
Theoretical papers assessment	20.00%	20.00%	Report
Final test	30.00%	60.00%	Final Exam
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The minimum score to consider the progress test must be 4 at each one. Practices and theoretical paper reports are essential to carry out the continuous evaluation. Failure to pass the progress tests and / or the final test will imply an overall grade for the subject less than 5 points, which will correspond to the score obtained in the last exam (the second progress test or the final test).

Those students who have not submitted a practice report will take a written exam of the practices, which represents 20% of the final grade. For students who have submitted a practice report, this mark will be maintained in the ordinary session, which represents 20% of the final mark. The student can keep this mark until the end of the course. Otherwise, they will take a practice exam in the extraordinary session.

Those students who have not submitted theoretical paper assessment report will take a written exam about that, which represents 20% of the final grade. For students who have submitted the report, this will be their grade corresponding to it in the ordinary session, which represents 20% of the final grade. The student can keep this mark until the end of the course. Otherwise, they will take an exam of this part in the extraordinary session.

During the final test, the use of programmable calculators or similar will not be allowed. No electronic devices, such as mobile phones, laptops, etc are allowed. Other devices which use wireless network will not be allowed.

Non-continuous evaluation:

Students under non-continuous assessment will take three exams in the ordinary session: final test (60% of the total mark); practice exam (20% of the total mark); theoretical paper exam (20% of the total mark).

To consider the mark in the final test it must be equal to or greater than 4, if not the overall mark will be the one obtained in this test.

During the final test, the use of programmable calculators or similar will not be allowed. No electronic devices, such as mobile phones, laptops, etc are

allowed. Other devices which use wireless network will not be allowed.

Specifications for the resit/retake exam:

Students who take the final exam will take a final test that represent 60% of the total grade. To consider the mark in the final test it must be equal to or greater than 4, if not the overall mark will be the one obtained in this test.

Students who have not submitted a practice report, or have obtained a grade lower than 4 in the practice report or in the ordinary practice exam, will take a written exam of the same, which will represent 20% of the final grade.

Students who have not submitted a theoretical paper report or have obtained a grade lower than 4 in the ordinary exam will take a written exam for this part, which will represent 20% of the final grade .

During the final test, the use of programmable calculators or similar will not be allowed. No electronic devices, such as mobile phones, laptops, etc are allowed. Other devices which use wireless network will not be allowed.

Failure to pass the compulsory activities (final test) will imply an overall grade for the subject of less than 5 points, which will correspond to the grade obtained in the final test.

Specifications for the second resit / retake exam:

In this case, it will be carry out only one final exam, representing 100% of the final mark. It is required to get at least 5 over 10 to pass the exam.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	5
Progress test [PRESENCIAL][Assessment tests]	2.5
Final test [PRESENCIAL][Assessment tests]	2.5
Unit 1 (de 6): General Concepts. Fluid properties.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2.5
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	.75
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	1.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 2 (de 6): Fluid Kinematics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.5
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	8
Unit 3 (de 6): Fundamental Equations in integral form	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	1
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	1
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	5
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	1.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Unit 4 (de 6): Differential equations in Fluid Mechanics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	1.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2.5
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	3
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	2
Writing of reports or projects [AUTÓNOMA][Self-study]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	20
Unit 5 (de 6): Hydraulic Transients	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	.75
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	1
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	1
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	1.5
Writing of reports or projects [AUTÓNOMA][Self-study]	4

Study and Exam Preparation [AUTÓNOMA][Self-study]	6

Unit 6 (de 6): Incompressible External Flow	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	.75
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	1
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	6

Global activity	
Activities	**hours**
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	10
Writing of reports or projects [AUTÓNOMA][Self-study]	12
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	5
Final test [PRESENCIAL][Assessment tests]	2.5
Off-site theoretical learning [AUTÓNOMA][Group tutoring sessions]	8
Class Attendance (theory) [PRESENCIAL][Problem solving and exercises]	5
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Progress test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	60
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Fox, R.W., McDonald, A.T., Pritchard, P.J., Leylegian, J.C	Fluid Mechanics	John Wiley and Sons		978-1-118-02641-0	2012	
Agüera Soriano, J	Mecánica de fluidos incompresibles y turbomáquinas hidráulicas	Ciencia 3		84-95391-01-05	2002	
L. Streeter	Fluid Mechanics	Mc Graw Hill		978-0-07-070140-3	2016	
White, F.M	Fluid Mechanics	Mc Graw Hill		978-9-814-72017-5	2016	
Çengel, Y.A., Cimbala, J.M.	Fluid Mechanics	Mc Graw Hill		978-1-259-92190-2	2018	
Fernández Oro, J.M	Técnicas numéricas en ingeniería de fluidos	Reverté		978-84-291-2602-0	2012	