UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: FLUID MECHANICS
Type: CORE COURSE
Degree: 344 - CHEMICAL ENGINEERING
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Year: 2
Main language: Spanish
Use of additional languages:
Web site:

Code: 57712
ECTS credits: 6
Academic year: 2023-24
Group(s): 21
Duration: First semester
Second language: English
English Friendly: Y
Bilingual: N

Lecturer: **ANTONIO DE LUCAS CONSUEGRA** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa Novella/Despacho 7	INGENIERÍA QUÍMICA	+34926295217	antonio.lconsuegra@uclm.es	Monday, tuesday, wednesday from 10:00 to 11:00

Lecturer: **JUAN FRANCISCO RODRIGUEZ ROMERO** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
ITQUIMA/Enrique Costa	INGENIERÍA QUÍMICA	6345	juan.rromero@uclm.es	Monday, Tuesday and Wednesday from 16:00 to 17:00

2. Pre-Requisites

Not established

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

The circulation or flow of fluids is of great importance not only in Chemical Engineering, but in all branches of Engineering. Its study is essential to understand and predict the behavior of gases and liquids in motion, which is of transcendental importance in the case

The implementation of this subject in the second year of the Degree in Chemical Engineering, supposes that the previous knowledge required in it has been developed in the first year subject of Initiation to Chemical Engineering. Parallel to the development of the F

4. Degree competences achieved in this course

Course competences

Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
E08	Knowledge of the basic principles of fluid mechanics and their application to solving problems in the field of engineering. Calculation of pipes, channels and fluid systems.
E31	Basic knowledge of the principles of transport phenomena and the kinetic and thermodynamic aspects of chemical processes
G01	Ability to write, sign and develop projects in the field of chemical engineering that are intended, according to the knowledge acquired as established in section 5 of order CIN / 351/2009 of February 9, construction, reform, repair, conservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial facilities and processes and manufacturing and automation processes.
G02	Capacity for the direction, of the activities object of the engineering projects described in the competence G1.
G03	Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and give them versatility to adapt to new situations.
G05	Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous works.
G10	Ability to work in a multilingual and multidisciplinary environment.
G12	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages
G20	Ability to analyze and solve problems
G22	Ability to apply theoretical knowledge to practice

5. Objectives or Learning Outcomes

Course learning outcomes

Description
To have knowledge about unit operations controlled by the transport of quantity of movement
To have the ability to calculate the power needed to drive a fluid through a network of pipes.
To have the skill to design a network of pipes incorporating the elements of regulation and measurement of flows.
To know the typical instrumentation used in chemical plants for the flow of fluids, from pipes to equipment used in the impulsion.
To have knowledge about equipment for the impulsion of fluids and their selection criteria.
To have the ability to calculate the load losses in pipes.

6. Units / Contents

Unit 1: Introduction to flow of fluids. Types of pressure and flow rates parameters: definitions and measurements
Unit 2: Types of flow. Fluids velocity distribution in pipes. Conservation equations: mass, quantity of movement and energy. Bernouilli equation
Unit 3: Friction between fluids and solids. Equations and graphic methods for calculating the friction factor. Fanning equation
Unit 4: pressure losses in fluid flow: incompressible and compressible flow
Unit 5: power required for the flow of luids: calculation of pumps and compressors. Multistage compressor systems.
Unit 6: Measurement of flows, local velocities and average velocities. Equipment and basic equations
Unit 7: Pipelines and accessories description: valves, fluid pumping systems. Net Positive Suction Head Calculation in pumps
Unit 8: External and biphasic flow of fluids. Calculation of most important examples in chemical industry.
Unit 9: Sedimentation induced by gravity: types and main equations
Unit 10: Filtration: types and main equations

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	CB01 E08 E31 G01 G02 G03	1.4	35	N	-	
Computer room practice [ON-SITE]	Practical or hands-on activities	CB01 E08 E31 G01 G02 G03 G05 G10 G12 G20 G22	0.2	5	Y	N	
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	CB01 E08 E31 G01 G02 G03 G05 G10 G12 G20 G22	0.6	15	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	E08 E31 G01 G02 G03 G10 G12 G20 G22	3.6	90	N	-	
Group tutoring sessions [ON-SITE]	Competitive Games	E08 E31 G01 G02 G03 G10 G12 G20 G22	0.1	2.5	Y	N	
Mid-term test [ON-SITE]	Assessment tests		0.1	2.5	Y	N	
		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	75.00%	0.00%	In the partial test, it may be required to obtain a certain result in the problems part.
Final test	0.00%	100.00%	In the final test, it may be required to obtain a certain result in the problems part.
Assessment of problem solving and/or case studies	25.00%	0.00%	In order to be considered within the continuous evaluation, the student must deliver at least 50% of the tasks proposed by the teachers.
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:

To pass the subject, the student must obtain at least 4 in each of the sections and an average grade equal to or greater than 5.
In partial tests, it may be required to obtain a certain result in the problem part.

Non-continuous evaluation:

An exam will be carried out in which all the activities and material taught in the subject will be evaluated. To pass, the exam grade must be equal to or greater than 5 and it may be required to obtain a certain result in the problem part.

Specifications for the resit/retake exam:

In the extraordinary exam, all the activities and material taught in the course will be evaluated. To pass it, the exam grade must be equal to or greater than 5 and it may be required to obtain a certain result in the problems part.

Specifications for the second resit / retake exam:

In this call all the activities and material taught in the subject will be evaluated. To pass in it, the note of the examination must be equal to or greater than 5 and it may be required to obtain a certain result in the problems part.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Computer room practice [PRESENCIAL][Practical or hands-on activities]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	23
Group tutoring sessions [PRESENCIAL][Competitive Games]	2.5

Unit 1 (de 10): Introduction to flow of fluids. Types of pressure and flow rates parameters: definitions and measurements

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	7

Unit 2 (de 10): Types of flow. Fluids velocity distribution in pipes. Conservation equations: mass, quantity of movement and energy. Bernouilli equation

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	8

Unit 3 (de 10): Friction between fluids and solids. Equations and graphic methods for calculating the friction factor. Fanning equation

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Unit 4 (de 10): pressure losses in fluid flow: incompressible and compressible flow

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Unit 5 (de 10): power required for the flow of luids: calculation of pumps and compressors. Multistage compressor systems.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	7

Unit 6 (de 10): Measurement of flows, local velocities and average velocities. Equipment and basic equations

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	7

Unit 7 (de 10): Pipelines and accessories description: valves, fluid pumping systems. Net Positive Suction Head Calculation in pumps

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Unit 8 (de 10): External and biphasic flow of fluids. Calculation of most important examples in chemical industry.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5

Unit 9 (de 10): Sedimentation induced by gravity: types and main equations

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Unit 10 (de 10): Filtration: types and main equations

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Global activity

Activities	hours
Group tutoring sessions [PRESENCIAL][Competitive Games]	2.5
Class Attendance (theory) [PRESENCIAL][Lectures]	29
Computer room practice [PRESENCIAL][Practical or hands-on activities]	5
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	13
Study and Exam Preparation [AUTÓNOMA][Self-study]	77
Total horas:	126.5

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Costa, E. y col	Ingeniería Química: 3. Flujo de fluidos	Alhambra	Madrid		1985	
Coulson, J.M. y col	Ingeniería Química. Tomos I y II	Reverté	Barcelona		1989	
Darby, Ron	Chemical engineering fluids mechanics	Marcel Dekker		0-8247-9628-4	1996	
Fox, R.W.; Mcdonald, A.T	Introducción a la mecánica de fluidos	Nueva Ed. Interamericana	Mexico		1995	
Levenspiel, O	Flujo de Fluidos e Intercambio de Calor	Reverte	Barcelona		1993	
White, Frank M.	Mecánica de fluidos	McGraw-Hill		978-84-481-6603-8	2008	
	Introducción a la ingeniería química	Síntesis		84-7738-664-1	2008	
Guillermo calleja y col	Nueva introducción a la ingeniería química: vol I	Síntesis	Madrid	978-84-9077-396-3	2016	