

**1. General information****Course:** SYSTEMS AND FLUID MACHINES**Type:** CORE COURSE**Degree:** 419 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING**Year:** 3**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56322**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 56**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** JAVIER BARBA SALVADOR - Group(s): 56

Building/Office	Department	Phone number	Email	Office hours
E'Lhuyar/3	MECÁNICA ADA. E ING. PROYECTOS		javier.barba@uclm.es	They will be published at the beginning of the semester

2. Pre-Requisites

In order to take this subject to the maximum advantage, it is recommended that the student has achieved competences related to the resolution of mathematical and physical problems. It is also recommended to have acquired competencies in knowledge of the basic principles of fluid mechanics and their application to problem solving in the field of engineering.

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

This subject deals with the fundamentals of fluid mechanical systems and machines and their practical application in the operation of pumps and hydraulic turbines.

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.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEM06	Applied knowledge of the fundamentals of fluid-mechanical systems and machinery.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
CG04	Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
CG06	Ability to handle specifications, regulations and mandatory standards.
CT01	Knowledge of a second language.
CT02	Knowledge and application of information and communication technology.
CT03	Ability to communicate correctly in both spoken and written form.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

Use and application of the basic principles to other hydraulic systems.

Use and application of the basic principles for design and dimensioning of hydraulic pump systems.

Use and application of the basic principles for design and dimensioning of hydraulic turbine systems.

6. Units / Contents**Unit 1: Fundamental principles of turbomachinery and fluid-mechanical systems****Unit 2: Hydraulic pumps****Unit 3: Hydraulic turbines****7. Activities, Units/Modules and Methodology**

	Related Competences						
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Training Activity	Methodology	(only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEM06 CG03 CG04 CG06 CT01 CT02 CT03	1.2	30	N	-	Description in the classroom of the theoretical and practical content, using the lesson method participatory masterclass. Presentation group work on content related to theoretical and practical aspects of course. It will include carrying out a job and presentation same in the classroom. The content and temporality of the work will be defined at the beginning of the semester and will communicate on the Moodle platform.
Problem solving and/or case studies [ON-SITE]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEM06 CG03 CG04 CG06 CT01 CT02 CT03	0.4	10	N	-	Problem solving in the classroom in a participative way.
Formative Assessment [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CEM06 CG03 CG04 CG06 CT01 CT02 CT03	0.2	5	Y	Y	Examination on contents related to theoretical aspects and practices of all the activities of the subject.
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CEM06 CG03 CG04 CG06 CT01 CT02 CT03	3.6	90	N	-	Final exam preparation on theoretical and practical aspects of course. Preparation of reports of practices, exercises, works and preparation of presentations.
Class Attendance (practical) [ON-SITE]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEM06 CG03 CG04 CG06 CT01 CT02 CT03	0.6	15	Y	Y	Realization, through small groups, laboratory practices and development of exercises with software specific. It will be valued use of assistance practice and report delivery practices corresponding to each of practices. In the report it will assess the use of theoretical content, learning of the measurement methods, the development of calculations, results and conclusions. The content and timing of internships will be defined at the beginning of the semester and will communicate on the Moodle platform.
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	70.00%	0.00%	There will be written tests that will consist of questions and problems. In the case of exams that have a theoretical part and a practical part, a minimum of 40% of the maximum grade that can be obtained in each part may be required in each part in order to make an average with the rest of the activities.
Projects	15.00%	15.00%	<p>1. Elaboration of problems and/or works</p> <p>In this section, the problems and/or works presented will be assessed, as well as the attitude shown by the student towards the activities. The following will be taken into account: problem statement, use of terminology, choice of procedure, justification of the process used, results obtained, cleanliness and presentation of the document. In addition, the delivered document must comply with the specific regulations for its delivery, which will be available to students on the Moodle platform.</p> <p>1. Presentation of works</p> <p>It consists of making one or several presentations in PowerPoint format in class or using Microsoft Teams. The presentation will be made individually and both the work presented will be valued, as well as the attitude shown by the student in the presentation and the ability to answer questions from the teacher and the rest of the students. In addition, the PPT document must comply with the specific regulations for its delivery, which will be available to students on the Moodle platform.</p>

			<p>Applicable to both cases: The student who has not delivered the requested documents will not be able to make the exhibition. On the other hand, that student who does not make the exhibition (even having delivered the documents in a timely manner), will not be able to be evaluated in this activity and must be examined in the extraordinary final exam of the contents related to this activity.</p> <p>Passing this activity may be kept for a maximum of two academic years.</p>
Final test	0.00%	70.00%	<p>There will be a written test consisting of questions and problems. In the case of exams that have a theoretical part and a practical part, a minimum of 40% of the maximum grade that can be obtained in each part may be required in each part in order to make an average with the rest of the activities.</p>
Practicum and practical activities reports assessment	15.00%	15.00%	<p>Experimental measurements will be carried out in the laboratory, in small groups. The face-to-face work carried out during the practice and the subsequent report of this will be valued. The report (delivered in groups of 2-3 students, via Moodle) must comply with the specific regulations for its delivery, which will be available to students on the Moodle platform. If the above requirements are not met, as it is a compulsory activity, the student will have to take an additional exam that covers the contents of the practices, together with the extraordinary final exam of the subject, whose value on the final grade will be the same than that indicated in this section.</p> <p>Passing this activity may be kept for a maximum of two academic years.</p>
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:

MINIMUM NOTES

Each activity (including the exam) will be passed when a grade of 4 or higher is obtained, that is, the minimum grade in each of the compulsory parts (including the exam) will be equal to or greater than 4. The subject will be passed obtaining a grade equal to or greater than 5.

CONSIDERATIONS IN CASE OF COPY

Those students who submit the copied works/practice scripts/presentations (that is, whose percentage of resemblance to another student/s, from their course or from previous ones, is greater than 80%), will be evaluated with a zero in this exercise. This means that they will have to be evaluated from the copied part in the final exam.

CIVIC CONSIDERATIONS FOR THE FINAL EXAM (AND THE PARTIAL EXAMS, IF ANY)

During the exam the use of programmable calculators will not be allowed. It is strictly forbidden to have mobile, recording or playback devices (this includes any device that allows communication with the outside or with other students) in the exam. Failure to comply with this rule will lead to the expulsion of the exam and the immediate obtaining of a suspense in that call for the subject. Students with more than three calls for attention during the exam (for conversations with classmates, for uncivil behavior, or lack of respect for the teacher) will be expelled from the exam and will obtain a fail in that session of the subject. Exams done in pencil will not be corrected.

SPECIAL CONSIDERATIONS

In the event that there are special circumstances that may affect attendance, such as long-term illnesses, exceptional work or personal circumstances, etc., it is recommended that the teaching staff be informed as soon as possible, in order to study a personalized work plan for the course.

Non-continuous evaluation:

Examination of all the contents and activities of the subject. The activities related to the delivery of work may be carried out via Teams in the event that the circumstances of the student or the teacher so determine, this exhibition having the same value as the one carried out in class. In the case of practices that cannot be carried out, they will be replaced by another activity/exam that develops the same contents as the practices.

Specifications for the resit/retake exam:

The activities passed in the ordinary call will be respected in this call

Students who have not completed the practices or have not passed them, as it is a compulsory activity, the student may take an additional exam (or another similar activity) that covers the contents of the practices, together with the extraordinary final exam of the subject, whose value over the final grade will be the same as that indicated in this section.

Students who have not prepared the works, nor have made the presentations, will be able to pass these contents in the extraordinary final exam of the subject or in an additional test.

The rest of the considerations are the same as in the ordinary call

Specifications for the second resit / retake exam:

Examination of all the contents and activities of the subject

The rest of the considerations are the same as in the ordinary call

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90

Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Agüera Soriano, José	Mecánica de fluidos incompresibles y turbomáquinas hidráulic	Editorial Ciencia 3		84-95391-01-05	2002	
Brennen, Christopher E.	Hydrodynamics of Pumps	Concepts ETI Oxford University Press		0-19-856442-2 (OUP)	1994	
Jutglar, Lluís	Bombas, ventiladores y compresores	Ceac		84-329-1200-X	2005	
Jutglar, Lluís	Bombas, ventiladores y compresores	Ceac		84-329-1200-X	2005	
Mataix, Claudio	Mecánica de fluidos y máquinas hidráulicas	Oxford University Press México AlfaOmega		968-6034-29-3 (Oxfor	2004	
Mataix, Claudio	Turbomáquinas hidráulicas: turbinas hidraulicas, bombas, ven	Universidad Pontificia de Comillas		978-84-8468-252-3	2009	
Pedro Fernández Díaz	Bombas. Turbinas. http://es.pfernandezdiez.es/				2014	Libro de Apuntes Libre
Viejo Zubicaray, Manuel	Energías eléctricas y renovables: turbinas y plantas generad	Limusa		978-607-05-0176-0	2010	
White, Frank M.	Mecánica de fluidos /	McGraw-Hill,		978-84-481-6603-8	2010	
Josep María Vergara	Mecánica de Fluidos. Problemas Resueltos	Ediciones UPC				
Blas Zamora Parra y Antonio Viedma Robles	Máquinas Hidráulicas. Teoría y Problemas.	Ed. Crai¿UPCT ediciones		9788416325191		