

340058 - ENFL-M6029 - Fluid Engineering

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	729 - MF - Department of Fluid Mechanics
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan

Teaching staff

Coordinator:	MONTSERRAT CARBONELL VENTURA
Others:	IVAN NIETO REINA JORDI PONS SEGALAS

Prior skills

Integral and differential calculus.
Differential equations.
Previous knowledge of fluid mechanics.

Requirements

340025 - Differential equations.
340026 - Advanced calculus.
340039 - Fluid Mechanics.

Degree competences to which the subject contributes

Specific:

1. CE24. Applied basic knowledge of fluid mechanical systems and machines.

Transversal:

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
3. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
4. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
5. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

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Teaching methodology

- Lectures and participatory classes, consisting of explanation and development of the theory and, if necessary in the resolution of problems. The material user will be available to the student in the Digital Campus section of the subject.
- Practical lessons in problem-solving, where it will seek the maximum involvement of students through their direct involvement in solving the problems. Students must solve in class / outside of class, individually or in groups, problems that are assigned. In the Digital Campus section of the subject, the student can look up the list of problems before they are done in class.
- Hand in resolved problems by students. Submittals will consist on individual or group solution, in class or outside class, of some problems of the list or similar, the student will have in the Digital Campus. This activity will be evaluated. The student feed-back can be made from the submission of the revised problems.
- Laboratory practical classes, made directly by students, guided by the teacher, allowing them to directly observe relevant aspects of the theory. The student can look up the explanatory text of the practices to develop in the Digital Campus. The students will give the teacher a copy of the experimental extracted data. Later, students must make a report of the practices carried out. This report will be evaluated and will be delivered before the date set by the teacher.
- Work related to the classes blocks will be requested to the student. The students, individually or in groups, have to work some parts of first issue. The presentation of the activity will be oral and will be evaluated.
- Tutorial classes in group or individual.
- Students will make two exams of all theoretical and practical knowledge developed in the subject.

Learning objectives of the subject

When the student finishes the subject, he/she has to be capable of:

- Applying knowledge of dimensional analysis and similarity to different problems of fluid mechanics.
- Knowing and calculating the forces over a body submitted to an external flow, in simple cases.
- Describing the principles of fluid machines.
- Analyzing and solving problems relating to facilities and hydraulic machines.
- Using simulation software of hydraulic networks.
- Knowing the basic principles of the compressors.
- Performing sequential pneumatic circuits.
- Knowing the preparation and distribution of compressed air.
- Knowing the basic principles of design of a compressed air installation.
- Communicating effectively in oral and written presentations.
- Working as a team autonomously and carrying out part of its coordination and / or direction.
- Planning and using the information necessary for an assignment, with a critical analysis of information resources.



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Study load

Total learning time: 150h	Hours large group:	52h 30m	35.00%
	Hours medium group:	0h	0.00%
	Hours small group:	7h 30m	5.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

<p>1. DIFFERENTIAL METHOD FOR THE FLOW ANALYSIS</p>	<p>Learning time: 2h Theory classes: 1h Self study : 1h</p>
<p>Description:</p> <ul style="list-style-type: none"> 1.1. Preliminary concepts 1.2. Kinematics of a fluid particle 1.3. Differential Equation of Continuity 1.4. Differential Equation of Momentum - Non-Viscous Flow (Euler's Equation) - Viscous and incompressible flow (Navier-Stokes equation) 	
<p>2. DIMENSIONAL ANALYSIS AND SIMILARITY</p>	<p>Learning time: 20h Theory classes: 8h Self study : 12h</p>
<p>Description:</p> <p>-</p>	
<p>3. EXTERNAL FLOW: DRAG AND LIFT</p>	<p>Learning time: 20h Theory classes: 7h 40m Self study : 12h 20m</p>
<p>Description:</p> <p>-</p>	
<p>4. TURBOMACHINERY INSTALLATIONS</p>	<p>Learning time: 42h 30m Theory classes: 13h Laboratory classes: 4h Self study : 25h 30m</p>
<p>Description:</p> <p>-</p>	

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<p>5. FUNDAMENTAL EQUATION OF TURBOMACHINERY</p>	<p>Learning time: 12h Theory classes: 4h Self study : 8h</p>
<p>Description: -</p>	
<p>6. TURBOMACHINES</p>	<p>Learning time: 6h 30m Theory classes: 3h Laboratory classes: 0h Self study : 3h 30m</p>
<p>Description: -</p>	
<p>7. PNEUMATIC SEQUENTIAL AND FACILITIES</p>	<p>Learning time: 27h Theory classes: 10h Laboratory classes: 2h Self study : 15h</p>
<p>Description: - Specific objectives: -</p>	

Qualification system

The different concepts that make up the continuous assessment are:

- Written individual examinations (75%)
- Laboratory practical and reports (10%)
- Submission of resolved problems (10%)
- Work and oral presentation (5%)

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Bibliography

Basic:

Çengel, Yunus A.; Cimbala, John M. Mecánica de fluidos : fundamentos y aplicaciones [on line]. 4a ed. México, D.F: McGraw-Hill, 2018 [Consultation: 31/07/2019]. Available on: <https://discovery.upc.edu/iii/encore/record/C__Rb1520496?lang=cat>. ISBN 9781456260941.

White, Frank M. Mecánica de fluidos. 6a ed. Madrid [etc.]: McGraw-Hill, 2008. ISBN 9788448166038.

De las Heras Jimenez, Salvador. Mecánica de fluidos en ingeniería [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 22/09/2014]. Available on: <<http://hdl.handle.net/2099.3/36608>>. ISBN 978-84-7653-936-1.

Potter, Merle C [et al.]. Mecánica de fluidos. 3a ed. México [etc.]: Prentice Hall, cop. 2001. ISBN 9706862056.

Complementary:

García Ortega, Justo. Problemas resueltos de máquinas hidráulicas y transitorios hidráulicos. Pamplona: Universidad Pública de Navarra, 2009. ISBN 9788497692472.

Bergadà Granyó, Josep Maria. Mecánica de fluidos: Breve introducción teórica con problemas resueltos [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 22/09/2014]. Available on: <<http://hdl.handle.net/2099.3/36611>>. ISBN 9788476539439.