Course guide
340058 - ENFL - Fluid Engineering

Last modified: 19/05/2026

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Miranda Neiva, Eric

Others: Cantó Atienza, Gemma

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 INFORMATI0N 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.

TEACHING METHODOLOGY

- Lectures and participatory classes, consisting of explanation and development of the theory, and 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 problemes. Students must solve in class / outside of class, individually, 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.
- 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 must make a report of the practices carried out. This report will be evaluated and will be delivered before the date set by the professor.
- 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.
- Familiarize with compressible flows.
- Working as a team autonomously and carrying out part of its coordination and / or direction.

STUDY LOAD

Type	Hours	Percentage
Hours small group	7,5	5.00
Self study	90,0	60.00
Hours large group	52,5	35.00

Total learning time: 150 h

CONTENTS

1. DIFFERENTIAL METHOD FOR THE FLOW ANALYSIS

Description:
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)

Full-or-part-time: 23h 10m
Theory classes: 7h
Self study : 16h 10m

2. DIMENSIONAL ANALYSIS AND SIMILARITY

Description:
-

Full-or-part-time: 18h 20m
Theory classes: 6h 20m
Self study : 12h

3. EXTERNAL FLOW: DRAG AND LIFT

Description:
-

Full-or-part-time: 22h 20m
Theory classes: 6h 20m
Self study : 16h

4. TURBOMACHINERY

Description:
-

Full-or-part-time: 21h 20m
Theory classes: 13h 10m
Self study : 8h 10m

5. TURBOMACHINERY INSTALLATIONS

Description:
-

Full-or-part-time: 36h 40m
Theory classes: 13h 40m
Laboratory classes: 5h 20m
Self study : 17h 40m

TOPIC 6. COMPRESSIBLE FLOW

Description:
-

Specific objectives:
-

Full-or-part-time: 28h 10m
Theory classes: 11h
Laboratory classes: 2h 10m
Self study : 15h

GRADING SYSTEM

The weighting of the different concepts that are part of the course assessment is:
- Individual written tests (76%): Partial exams (CP1 (38%) and CP2 (38%))
- Laboratory practices (16%)
- Submission of solved exercises (8%)

The formula for the final grade is:
Final Grade = 0.38 * CP1 Grade + 0.38 * CP2 Grade + 0.16 * Lab Reports Grade + 0.08 * Problem Set Submission

A student may opt for a re-evaluation if they have received a final grade of 2.0 or higher.
The re-evaluation will consist of a Comprehensive Final Exam covering the theory and problems from CP1 and CP2. The Comprehensive Final Exam will account for 76% of the grade.
Once the re-evaluation Global Exam (GE) has been taken, the final re-evaluation grade will be obtained by following the expression below:
Final Re-evaluation Grade = GE Score * 0.76 + Lab Report Score * 0.16 + Problem Set Submission * 0.08

The grade obtained on the re-evaluation will replace the previous grade on the re-evaluable portion, provided it is higher, and will count for a maximum of a 7.0 in the final course grade.
If the student who takes the re-evaluation does not pass the course, the higher of the regular assessment result and the re-evaluation result will be retained.

EXAMINATION RULES.

- Each of the two individual written tests will consist of a certain number of problems. The first test will account for 38% of the final grade, while the second test will account for 38% of the final grade.
- Laboratory practice reports will be evaluated according to the rubric established for their completion, which will be made available to students in advance. In order to receive a grade for the laboratory practicals, it is essential to have completed the practicals and to submit the reports with the group with which the practical was carried out in the laboratory.
- For the submission of individually solved problems, the professor will indicate the date on which the students must submit them. These will be completed by the students outside of class and submitted via Atenea within the time frame established
by the professor.

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: 20/02/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8102. ISBN 9781456260941.
- White, Frank M. Mecánica de fluidos [on line]. 6a ed. Madrid [etc.]: McGraw-Hill, 2008 [Consultation: 16/02/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4144. ISBN 9788448166038.
- Heras, Salvador de las. Mecánica de fluidos en ingeniería [Recurs electrònic] [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 05/04/2022]. Available on: https://upcommons.upc.edu/handle/2099.3/36608. ISBN 9788476539354.
- Potter, Merle C [et al.]. Mecánica de fluidos. 4a ed. México [etc.]: Cengage, 2012. ISBN 9786075194509.

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, 2017 [Consultation: 05/04/2022]. Available on: https://upcommons.upc.edu/handle/2117/111266. ISBN 9788498806885.