Course guide
340058 - ENFL-M6O29 - Fluid Engineering

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: 2023 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: Carbonell Ventura, Montserrat
Others: Cantó Atienza, Gemma
Moreno Maestro, David

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:

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.
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 feedback can 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.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>7,5</td>
<td>5.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>52,5</td>
<td>35.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
# CONTENTS

## 1. DIFFERENTIAL METHOD FOR THE FLOW ANALYSIS

**Description:**
- Preliminary concepts
- Kinematics of a fluid particle
- Differential Equation of Continuity
- 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
6. PNEUMATIC SEQUENTIAL AND FACILITIES

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

GRADING SYSTEM

The different concepts that make up the continuous assessment are:
- Written individual examinations (77%)
- Laboratory practical and reports (9%)
- Submission of resolved problems (9%)
- Work and oral presentation (5%)

BIBLIOGRAPHY

Basic:
- Heras, Salvador de las. Mecánica de fluidos en ingeniería [Recurs electrònic] [on line]. Barcelona: Iniciativa Digital Politècnica, 2012  

Complementary: