220112 - Fluid Technology

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics
Academic year: 2018
Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 4,5
Teaching languages: Catalan

Teaching staff
Coordinator: Esteve Codina Macià i Pedro Javier Gamez-Montero

Requirements
It is considered essential to have passed the subject of Fluid Mechanics.

Degree competences to which the subject contributes
Specific:
1. Applied knowledge of the fundamentals of fluid-mechanics systems and machines.

Teaching methodology
- Lecture presenting the contents.
- Practical work.
- Independent work and study exercises.
- Preparation and assessable activities in groups.

Learning objectives of the subject
After completing the course, students must have achieved Level 3 (application) with general learning objectives:

Technology in the field of specialty
- Understand the scientific foundations
- Know how to use the technology and the necessary engineering

professional performance
- Analyze specific situations, define problems, make decisions and implement plans of action in the search for solutions.
- Apply knowledge to real situations, managing resources appropriately.
- Interpret studies, reports, and analyze data numerically.
- Select and manage the information sources.
- Use existing tools as support.
- Working in a multidisciplinary team.
- Evaluate the integral, personal motivation, mobility.

communication
- Understand and speak with the proper terminology.
- Discuss and argue on various forums.

Technology transfer.
- Analyze and evaluate the environmental, social and ethical profession.
220112 - Fluid Technology

- Have a critical and innovative spirit.
- Retraining in new technological developments through continuous learning.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>31h</th>
<th>27.56%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>14h</td>
<td>12.44%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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Total learning time: 112h 30m
## Content

### Module 1: INTRODUCTION TO DESIGN

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 5h</th>
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<tbody>
<tr>
<td>1.1. Analysis / Design (direct problem and inverse problem)</td>
<td>Theory classes: 2h</td>
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<tr>
<td>1.2. Types of analysis: integral, differential, and dimensionless</td>
<td>Laboratory classes: 1h</td>
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<tr>
<td>1.3. Fluids</td>
<td>Self study: 2h</td>
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<tr>
<td>1.4. Examples of applications</td>
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<table>
<thead>
<tr>
<th>Related activities:</th>
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</thead>
<tbody>
<tr>
<td>A - Autotests</td>
</tr>
<tr>
<td>E- Application Exercises/Seminars</td>
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<tr>
<td>EX1 - First exam</td>
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### Module 2: ANALYSIS FLUIDOESTÀTIICO

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<thead>
<tr>
<th>Description:</th>
<th>Learning time: 12h</th>
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<tbody>
<tr>
<td>2.1. Hydrostatic gravity field</td>
<td>Theory classes: 4h</td>
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<tr>
<td>2.2. Hydrostatic forces on surfaces</td>
<td>Laboratory classes: 2h</td>
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<tr>
<td>2.3. Buoyancy</td>
<td>Self study: 6h</td>
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<td>2.4. Stability of floating and submerged bodies</td>
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<td>2.5. Examples of applications</td>
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<tr>
<td>EX1 - First exam</td>
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## Module 3: INTEGRAL DYNAMIC ANALYSIS

**Learning time:** 40h  
Theory classes: 10h  
Laboratory classes: 5h  
Self study: 25h  

**Description:**  
3.1. Propaedeutic concepts: conservation laws  
3.2. Macroscopic isothermal systems  
3.3. Design and calculation examples of elements, machinery and equipment for handling fluids (agitators, jets, tanks, piping systems turbomachinery control systems, etc.)  
3.4. Use of macroscopic balances to raise unsteady flow problems  

**Related activities:**  
A - Autotests  
E - Application Exercises/Seminars  
EX1 - First exam

## Module 4: DIFFERENTIAL DYNAMIC ANALYSIS

**Learning time:** 39h  
Theory classes: 10h  
Laboratory classes: 4h  
Self study: 25h  

**Description:**  
4.1. Propaedeutic concepts: equations of motion: Cauchy, Navier-Stokes, Reynolds, Euler, Bernoulli  
4.2. Examples of applications of low Re flows: bearings (hydrostatic and dynamic fluid), lubrication, food handling, flow in porous media, etc.  
4.3. Examples of applications of high Re flows: objects submerged in a stream, drag and lift for symmetric and asymmetric objects  
4.4. Examples of applications in transient regimen: oscillations, startup and shutdown of machines, etc.  

**Related activities:**  
A - Autotests  
E - Application Exercises/Seminars  
EX2 - Final exam
Module 5: DIMENSIONAL ANALYSIS AND EXTERNAL FLOW

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<tr>
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<tr>
<td>5.1. The laws of similarity (geometric, kinematic and dynamic)</td>
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<td>5.2. Theory models, design of experiments and the correlation of experimental data.</td>
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<td>5.3. Examples of applications</td>
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<tr>
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<tr>
<td>E - Application Exercises/Seminars</td>
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<tr>
<td>EX2 - Final exam</td>
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Learning time: 16h 30m
- Theory classes: 5h
- Laboratory classes: 2h
- Self study: 9h 30m

Qualification system

Individual autotests as independent learning.
The exams consist of two exercises lasting approximately two hours.

*The unsatisfactory results of the examination of the first mid-term, may be re-conducted only by students with a grade lower than 5. The second mid-term exam will be replaced by a final examination with the content of the whole subject of the course, with parts differentiated by terms. The final mark corresponding to the term exams (70%) will be the highest between the final examination and the weighting between the first mid-term exam and the parts of the second mid-term exam in the final examination.

Regulations for carrying out activities

- 1st Evaluation: midterm exam, weight: 35% (with the possibility of recovery test midterm)
- 2nd Evaluation: final exam, weight: 35%
- Seminars: 20%
- Autotests (type self-test individual): 10%
Bibliography

Basic:


Complementary:


