820013 - MF - Fluid Mechanics

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics
Academic year: 2018
Degree: BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
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BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: CARLOS RUIZ MOYA - JOSEP XERCAVINS VALLS
Others: ALBERT CARBÓ - JOAN GRAU - ALFRED FONTANALS - CARLOS RUIZ - JOSEP XERCAVINS - ATTILA HUSAR - ALEJANDRO CARRILLO

Requirements

Degree competences to which the subject contributes

Specific:
2. Understand the basic principles of fluid mechanics and its application to problems in the field of engineering. Calculate the parameters of ducts, channels and fluid systems.

Transversal:
1. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

Teaching methodology
The subject will be developed using master classes to present the contents to the students. The students will have to do individual work for problem solving and test preparing, and also team work for lab experiences and complex problem solving.

Learning objectives of the subject
Giving the students the knowledge and basic skills on this subject in order to prepare him for professional tasks related to the contents of it, and at the same time encouraging the training and learning processes in the field of fluid mechanics engineering.
# Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time:</td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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## Content


**Learning time:** 21h 30m  
Theory classes: 7h 30m  
Laboratory classes: 1h  
Self study: 13h

**Description:**  

**Specific objectives:**  
Understanding the basic concepts of fluid mechanics. Identifying different kinds of problems in fluid mechanics. Applied knowledge of basic fluid properties and the influence of viscosity on friction in fluid flow.

### 2. Hydrostatics.

**Learning time:** 18h 30m  
Theory classes: 6h 30m  
Laboratory classes: 1h  
Self study: 11h

**Description:**  

**Specific objectives:**  
Achieving the capacity to determine the pressure distribution in a still fluid, to calculate hydrostatic forces over flat and curved submerged surfaces and to determine the pressure distribution in fluids in motion as rigid solids.

### 3. Basic concepts for flow analysis.

**Learning time:** 10h 30m  
Theory classes: 3h 30m  
Laboratory classes: 1h  
Self study: 6h

**Description:**  

**Specific objectives:**  
Understanding the use of the material derivative for connecting the Eulerian and the Lagrangian approach, identifying different flow visualization techniques, understanding the use of Reynolds' transport theorem and knowing the differential, integral, experimental and computational techniques used for flow analysis.
<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
<th>Specific objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Basic integral equations in fluid mechanics (I).</strong></td>
<td>40h 30m</td>
<td>Continuity equation: massic and volumetric flow. Energy equation. Bernoulli equation. Scope and limitations. Velocity and flow rate meters.</td>
<td>Correctly applying the concepts of compressibility and steadiness in flow determination. Identifying and correctly estimating the different forms of mechanical energy together with the efficiency in their transformations. Correctly using Bernoulli’s equation in solving basic hydraulic problems and in velocity and flow rate meters.</td>
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</tbody>
</table>
7. Free surface flows

Description:

Specific objectives:
Solving slow problems in steady state open canals. Using pouring systems for flow control and measurement.

Learning time: 16h 30m
Theory classes: 5h 30m
Laboratory classes: 1h
Self study: 10h

Qualification system
Evaluation will be done by means of written tests both for mid-terms and final exams. Exercises and problems will be evaluated from the material submitted by the student. Lab experiences will be evaluated based on previous test, assistance, developed tasks in the lab and lab reports.
Mid-term 1: 35 %
Exercises/Problems: 10 %
Lab experiences: 15 %
Team work: 5 %
Mid-Term 2: 35 %

This course will re-evaluation test as established by the rules of the school. The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

Regulations for carrying out activities
Lab experiences are mandatory.

Bibliography

Basic:

Complementary: