280645 - Fluid Mechanics

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2020
Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MARINE TECHNOLOGIES/BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2016). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff
Coordinator: Anna Mujal i Colilles

Opening hours
Timetable: Tuesday 12:00-13:30
Friday 12:00-13:30

Prior skills
- Algebra
- Calculus
- Physics

Degree competences to which the subject contributes

Specific:
1. Knowledge of the fundamental concepts of fluid mechanics and its application to the operation and use of naval systems.
2. Knowledge of the fundamental concepts of fluid mechanics and its application to the hulls of ships and artifacts, and machines, equipment and naval systems.

Teaching methodology
- Analysis of the state of the art of the subject
- To acquire, understand and synthesize knowledge
- Setting-up and resolution of problems
- To carry works out individually and in group
- To apply computer analysis techniques

Learning objectives of the subject
- To acquire knowledge about the theory and concepts of the fluid mechanics.
- To know and be able to apply the basis of the fluid mechanics to the analysis of machinery, equipment and naval systems.
- To use the computer analysis resources to solve problems in fluid mechanics.
This course will evaluate the following STCW competences:
5. Operate fuel, lubrication, ballast and other pumping systems and associated control systems (STWC A-III_1)
The corresponding Knowledge, understanding and proficiency points according to the STWC competences are:
5.1. Operational characteristics of pumps and piping systems, including control systems
5.3 Oily-water separators (or similar equipment) requirements and operation

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time</strong>: 150h</td>
<td>35h</td>
<td>15h</td>
<td>0h</td>
<td>10h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>23.33%</td>
<td>10.00%</td>
<td>0.00%</td>
<td>6.67%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
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## Content

<table>
<thead>
<tr>
<th>Introduction to Fluid Mechanics</th>
<th>Learning time: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Self study: 10h</td>
</tr>
</tbody>
</table>

**Description:**
STWC A-III_1 KUP's are included: Oily-water separators (or-similar equipment) requirements and operation.

<table>
<thead>
<tr>
<th>Hydrostatics</th>
<th>Learning time: 26h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 12h</td>
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</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Basic equations of fluid mechanics</th>
<th>Learning time: 34h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 4h</td>
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<tr>
<td></td>
<td>Self study: 18h</td>
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</table>

**Description:**

<table>
<thead>
<tr>
<th>Dimensional analysis and similarity</th>
<th>Learning time: 22h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 12h</td>
</tr>
</tbody>
</table>

**Description:**
The principle of dimensional homogeneity. The Pi theorem. Nondimensionalization of the basic equations. Reynolds number.
Planning of activities

**Viscous flow in ducts**

**Learning time:** 24h
- Theory classes: 6h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study: 12h

**Description:**

**Free surface flows**

**Learning time:** 24h
- Theory classes: 6h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study: 12h

**Description:**

**OpenFOAM work**

**Hours:** 20h
- Laboratory classes: 20h

**Description:**
This work will be performed by three students throughout the course. The grades of the "continuous evaluation" will be the grade obtained in this work together with the mark obtained during the oral presentation.

**Support materials:**
OpenFOAM

**Specific objectives:**
- To learn fluid mechanics practical applications
- Work with other students
- Learn to present oral works

**Qualification system**

\[ NF = 0.35P_1 + 0.25P_2 + 0.4AC \]

- NF: Final Grade
- P1: Parcial Exam 1
- P2: Parcial Exam 2
- AC: Homework
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Regulations for carrying out activities

Homework must be presented before the due date. Otherwise the grade of this task will be 0. The student not presenting to any of the activities of the course will be qualified as "not taken"

Bibliography

Basic:


Complementary:

