Course guide

280645 - 280645 - Fluid Mechanics

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering.
Degree: BACHELOR’S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Compulsory subject).
BACHELOR’S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: ANNA MUJAL COLILLES

Others: Segon quadrant: MONTSERRAT DOLZ RIPOLLÉS - Grup: DT, Grup: GESTN, Grup: GTM
PAU TRUBAT CASAL - Grup: DT, Grup: GESTN, Grup: GTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
GTM.CE19. Knowledge of the fundamental concepts of fluid mechanics and its application to the operation and use of naval systems.
GESTN.CE7. Knowledge of the fundamental concepts of fluid mechanics and its application to the hulls of ships and artifacts, and machines, equipment and naval systems.

STCW:
ME.1. A-III/1-1. Function: Marine engineering at the operational level
ME.2. A-III/1-1.5 Operate fuel, lubrication, ballast and other pumping Systems and associated control systems
ME.3. A-III/1-KUP 1.5.1 Operational characteristics of pumps and piping systems, including control systems
ME.4. A-III/1-KUP 1.5.2 Operation of pumping systems: .1 routine pumping operations, .2 operation of bilge, ballast and cargo pumping systems
ME.5. A-III/1-KUP 1.5.3 Oilywater separators (or similar equipment) requirements and operation

TEACHING METHODOLOGY

- 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.
**STUDY LOAD**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>35,0</td>
<td>23.33</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>10,0</td>
<td>6.67</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

**CONTENTS**

1. **Introduction to Fluid Mechanics**

   **Description:**

   **Related competencies:**
   A31-1.5.3. A-III/1-KUP 1.5.3 Oilywater separators (or similar equipment) requirements and operation

   **Full-or-part-time:** 20h
   Theory classes: 10h
   Self study: 10h

2. **Hydrostatics**

   **Description:**

   **Full-or-part-time:** 26h
   Theory classes: 8h
   Laboratory classes: 4h
   Guided activities: 2h
   Self study: 12h

3. **Basic equations of fluid mechanics**

   **Description:**

   **Full-or-part-time:** 34h
   Theory classes: 8h
   Laboratory classes: 4h
   Guided activities: 4h
   Self study: 18h
### 4. Dimensional analysis and similarity

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

**Full-or-part-time:** 22h  
Theory classes: 4h  
Laboratory classes: 4h  
Guided activities: 2h  
Self study: 12h

### 5. Viscous flow in ducts

**Description:**

**Related competencies:**
A31-1.5.2. A-III/1-KUP 1.5.2 Operation of pumping systems: .1 routine pumping operations, .2 operation of bilge, ballast and cargo pumping systems
A31-1.5.1. A-III/1-KUP 1.5.1 Operational characteristics of pumps and piping systems, including control systems

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

### 6. Free surface flows

**Description:**

**Full-or-part-time:** 24h  
Theory classes: 6h  
Laboratory classes: 4h  
Guided activities: 2h  
Self study: 12h
ACTIVITIES

### Potential Flow work

**Description:**
This work will be performed by three students throughout the course.

**Specific objectives:**
- To learn fluid mechanics practical applications
- Work with other students

**Material:**
Potential Flow assessment program

**Related competencies:**
- CE19.GEM. Knowledge of the fundamental concepts of fluid mechanics and its application to the operation and use of naval systems.
- CE7.GESTN. Knowledge of the fundamental concepts of fluid mechanics and its application to the hulls of ships and artifacts, and machines, equipment and naval systems.

**Full-or-part-time:** 10h
Laboratory classes: 10h

### Course exercise presentation

**Description:**
Along the course, students in groups of three must present and solve a class exercise proposed by the teacher. Students must make a short presentation and summary of the theory applied to solve the problem.

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

**Material:**
Class exercises and teaching material

**Related competencies:**
- CE7.GESTN. Knowledge of the fundamental concepts of fluid mechanics and its application to the hulls of ships and artifacts, and machines, equipment and naval systems.
- CE19.GEM. Knowledge of the fundamental concepts of fluid mechanics and its application to the operation and use of naval systems.

**Full-or-part-time:** 10h
Laboratory classes: 10h

### GRADING SYSTEM

\[ NF = 0.35P1 + 0.25P2 + 0.4AC \]

NF := Final Grade
P1 := Parcial Exam 1
P2 := Parcial Exam 2
AC := Homework
EXAMINATION RULES.

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: