280619 - Ship Theory and Naval Construction

**Coordinating unit:** 280 - FNB - Barcelona School of Nautical Studies  
**Teaching unit:** 742 - CEN - Department of Nautical Sciences and Engineering  
**Academic year:** 2019  
**Degree:** BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Teaching unit Compulsory)  
**ECTS credits:** 9  
**Teaching languages:** Catalan, Spanish

### Teaching staff

**Coordinator:** MARCEL·LA CASTELLS SANABRA  
**Others:** MARCEL·LA CASTELLS SANABRA - 1  
JORGE MONCUNILL MARIMON - 2

### Opening hours

**Timeetable:** MARCEL·LA CASTELLS SANABRA. 10:00 a 13:00 Monday and de 10:00 a 13:00 Wednesday  
JORGE MONCUNILL MARIMON. Monday, Tuesday, Wednesday and Thursday: from 12:00 to 13:00; Friday: from 17:00 to 19:00.

### Requirements

Having passed the course of “Ship Stability” Q4 Grade Nautical and Maritime Transport or this subject should be in compensated conditions at the end of the cycle.

### Degree competences to which the subject contributes

**Specific:**

### Teaching methodology

- Receive, understand and synthesize knowledge.  
- Solve problems.  
- Develop the reasoning and critical thinking

### Learning objectives of the subject

- Know the issues of flooding and grounding  
- Understand the effects of movement as well the dynamics of marine vehicles.  
- Know the properties and structural elements of a ship.  
- Know the hydrodynamic resistance, the types of marine propulsion and the materials used in shipbuilding.  
- To be able to calculate the longitudinal strength to which the structure of a ship is subjected.

On the other hand, one of the objectives of this subject is provide the knowledge, understanding and proficiency of the competency "Respond to emergencies" of Table A-II/1-5 and the competency "Respond to navigational emergencies" of
Table A-II/2-9 and "Control Trim, stability and Stress" of Table A-II/2-15 of the Seafarers, Training, Certification and Watchkeeping (STCW) International Code.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 225h</th>
<th>Hours large group: 45h</th>
<th>20.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 45h</td>
<td>20.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 135h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distribution of cargo between two holds</td>
<td>10h</td>
<td>4h</td>
<td>6h</td>
</tr>
<tr>
<td></td>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In this chapter the distribution of cargo between two or more holds will be studied.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Relationship between the type of ship and her stability</td>
<td>30h</td>
<td>12h</td>
<td>18h</td>
</tr>
<tr>
<td></td>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buoyancy and Static Stability. Transversal and longitudinal Dynamics. Knowledge of IMO recommendations concerning ship stability (A-II/2-15.3) and explore the characteristics of stability according to the type of vessel: tankers, fishing vessels, icebreakers, high speed crafts, among others. Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability (this knowledge is necessary in accordance with STCW Code Table A-II/2-15.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bulk grain loading</td>
<td>20h</td>
<td>8h</td>
<td>12h</td>
</tr>
<tr>
<td></td>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Background Information concerning bulk grain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Calculations of volumetric heeling moments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stability regulations for loading bulk grain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Optimum trim</td>
<td>5h</td>
<td>2h</td>
<td>3h</td>
</tr>
<tr>
<td></td>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Study of the optimum trim of the vessel for fuel consumption efficiency.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter 5. Stabilizer systems and Ship Dynamics</td>
<td>Learning time: 15h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory classes: 6h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self study: 9h</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description:**
- Description of the classification and functionality of the different stabilizer systems.
- Ship Dynamics

<table>
<thead>
<tr>
<th>Chapter 6. Grounding</th>
<th>Learning time: 35h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 14h</td>
</tr>
<tr>
<td></td>
<td>Self study: 21h</td>
</tr>
</tbody>
</table>

**Description:**
- Overview. Initial action to be taken following a collision or a grounding; initial damage assessment and control (Table A-II/1-5.2 STCW code)
- Calculate the reaction
- Effect of grounding on the drafts, transverse stability and heel
- Precautions when beaching a ship (Table A-II/2-9.1 STCW code)
- Action to be taken if grounding is imminent, and after grounding (Table A-II/2-9.2 STCW code)
- Re-floating a grounded ship with and without assistance (Table A-II/2-9.3 STCW code)
- Drydocking

<table>
<thead>
<tr>
<th>Chapter 7. Flooding and damage compartments</th>
<th>Learning time: 35h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 14h</td>
</tr>
<tr>
<td></td>
<td>Self study: 21h</td>
</tr>
</tbody>
</table>

**Description:**
- Types of flooding.
- Methods of calculation of the flood.
- Effects of flooding on the drafts, list and stability.
- Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause (Table A-II/2-9.4 Code STCW)
- Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and counter measures to be taken (Table A-II/2-15.2 Code STCW).
## Chapter 8. Properties and structural elements of a ship

**Description:**
- Description and comprehension of the properties that a ship must have.
- Knowledge of the structure, parts and elements of ships.

**Learning time:** 30h
- Theory classes: 12h
- Self study: 18h

## Chapter 9. Ship Resistance and Propulsion

**Description:**
- Basic notions of hydrodynamic resistance and propulsion.
- Types of propulsion.

**Learning time:** 15h
- Theory classes: 6h
- Self study: 9h

## Chapter 10. Materials used in naval construction and their protection

**Description:**
- Notions of the types of materials used in shipbuilding and their characteristics.
- Maintenance.

**Learning time:** 10h
- Theory classes: 4h
- Self study: 6h

## Chapter 11. Longitudinal strength and vibrations

**Description:**
- Incidence of the cargo distribution and the waves in the longitudinal strength of a ship.
- Determination of the load curves, shear forces and bending moments.

**Learning time:** 20h
- Theory classes: 8h
- Self study: 12h
The final score is the sum of the following partial grades:
\[ N_{\text{final}} = 0.67N_{\text{ss}} + 0.33N_{\text{c}} \]

- \( N_{\text{final}} \): final score
- \( N_{\text{ss}} \): final score ship stability theme
- \( N_{\text{c}} \): final score naval construction theme

From both parts, there will be some partial exams during the course and continuous assessment.

\( N_{\text{ss}} = 40\% \text{ final exam} + 40\% \text{ partial exam} + 20\% \text{ continuous assessment} \); a minimum score of 4 for the partial exam is required. Otherwise, all the themes will be included in the final exam.

\[ N_{\text{c}} = \text{Partial exam note (topics 8 and 9)} \times 50\% + \text{Final exam note (topics 10 y 11)} \times 50\% \]; a minimum score of 4 for the partial exam is required. Otherwise, all the themes will be included in the final exam.

The act of re-evaluation will be done through a final exam where all the course material will be assessed.

### Regulations for carrying out activities

- You can't pass the course if all work activities and continuous assessment are carried out and submitted.
- If the student does not carry out partial and/or final exam, he or she will be considered as: Not Presented
- In any case, the student can use any kind of predesigned form in controls or tests.

### Bibliography

#### Basic:


#### Complementary: