Course guide
280806 - 280806 - Analysis and Design of Ship and Ocean Structures

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering.
Degree: MASTER'S DEGREE IN NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Compulsory subject).
Academic year: 2022 ECTS Credits: 5.0 Languages: Spanish

LECTURER
Coordinating lecturer: JAVIER MARTINEZ GARCIA
Others: Segon quadrimestre: JAVIER MARTINEZ GARCIA - Grup: MUENO

PRIOR SKILLS
Bachelor in System Engineering and Naval Technology
Bachelor in Naval Architecture

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
MUENO_CE1. Ability to design ships suitable for the needs of the maritime transport of people and goods, and those of maritime defense and security
MUENO_CE3. Knowledge of the dynamics of the ship and of the naval structures, and ability to perform optimization analysis of the structure, the integration of the systems on board, and the behavior of the ship at sea and its maneuverability
MUENO_CE7. Ability to project ocean platforms and artifacts
MUENO_CE16. Ability to develop and manage logistics support engineering, maintenance and repair of ships and artifacts

Generical:
MUENO_CG2. Ability to conceive and develop solutions that are technically, economically and environmentally appropriate to the needs of maritime or integral transportation of people and goods, of the use of oceanic resources and of the marine subsoil (fishing, energy, minerals, etc.), adequate use of the marine habitat and means of defense and maritime security
MUENO_CG3. Ability to project ships and boats of all kinds
MUENO_CG5. Ability to design and control the construction, repair, transformation, maintenance and inspection processes of previous Mills
MUENO_CG6. Ability to conduct research, development and innovation in naval and ocean products, processes and methods
MUENO_CG8. Ability to analyze and interpret measurements, calculations, evaluations, appraisals, studies, reports, work plans and other similar works
MUENO_CG15. Ability to organize and direct multidisciplinary work groups in a multilingual environment, and to generate reports for the transmission of knowledge and results
**Transversal:**

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Know and understand the complexity of economic and social phenomena typical of the welfare society, being able to relate welfare to globalization and sustainability; acquire skills to use in a balanced manner compatible technology, technology, economics and sustainability.

CT3. TEAMWORK: Ability to work as a member of an interdisciplinary team, either as a member or performing management tasks, with the aim of contributing to projects pragmatically and sense of responsibility, assuming commitments considering the resources available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty, and critically evaluate the results of this management.

CT5. THIRD LANGUAGE Learning a third language, preferably English, with adequate oral and written and in line with the future needs of the graduates.

**Basic:**

CB6. Possess knowledge and understanding that provide a basis or opportunity be original in the development and / or application of ideas, often in a research context.

CB7. That the students can apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their study area.

CB8. Students should be able to integrate knowledge and handle the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the responsibilities social and ethical linked to the application of their knowledge and judgments.

CB9. That students can communicate their conclusions and the knowledge and Latest rationale underpinning to specialists and non-Specialty clearly and unambiguously.

CB10. Students must possess the learning skills that enable them continue studying in a way that will be largely self-directed or autonomous.

**TEACHING METHODOLOGY**

- Master Class
- Class with students participation
- Cooperative learning
- Self learning by solving problems and exercises
- Learning based on projects

**LEARNING OBJECTIVES OF THE SUBJECT**

Capacity to design and develop the project of a ship or a marine structure, according to given requirements.

Capacity to solve correctly problems related to marine and ship engineering based on serviceability needs as well as fulfilling safety, environmental and economic requirements.

Capacity to apply basic and advanced concepts regarding marine and ship engineering to the solution of problems of marine and ship engineering.

Knowledge of the structural strength mechanisms and their application for designing ships and offshore platforms. Knowledge of the most common failure mechanisms and the means to prevent them. Capacity to design safe structures complying with standards.

Capacity to solve complex mathematical problems and their application to the solution of engineering problems. Knowledge of the numerical tools available to solve these problems.

**STUDY LOAD**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>100.00</td>
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Total learning time: 45 h
### 1. Introduction to ship design and marine structures

**Description:**
Design procedure of the ship and marine structures.  
Limit state analysis.  
Relation between limit state analysis and strength of materials theory.  
Numerical analysis methods.

**Full-or-part-time:** 6h  
Theory classes: 3h  
Self study: 3h

### 2. Structural elements analysis and design

**Description:**
Normal and tangential stresses in beam elements.  
Lateral buckling of beams.  
Buckling of panels.  
Analysis of bolted connections.  
Analysis of welded connections.

**Full-or-part-time:** 34h  
Theory classes: 8h  
Practical classes: 8h  
Self study: 18h

### 3. Loads in ships and marine structures

**Description:**
Loads in ships.  
Loads in marine structures.  
Load combination.

**Full-or-part-time:** 18h  
Theory classes: 6h  
Guided activities: 4h  
Self study: 8h

### 4. Longitudinal strength of hull girder

**Description:**
Longitudinal strength of hull girder.  
Ship cross sections.  
Longitudinal stresses in the ship.  
Torsional effects on the hull.  
Elements distribution and stress concentrations.

**Full-or-part-time:** 20h  
Theory classes: 4h  
Practical classes: 4h  
Self study: 12h
5. **Transverse strength of the ship**

**Description:**
Transverse strength of the ship.
Design and analysis of structural elements.

**Full-or-part-time:** 15h
Theory classes: 2h
Practical classes: 2h
Self study: 11h

6. **Analysis structural elements in the ship**

**Description:**
Design of structural elements in the ship.
Structural particularities of the different structural elements of the ship.

**Full-or-part-time:** 16h
Theory classes: 2h
Guided activities: 4h
Self study: 10h

7. **Dynamic analysis of marine structures**

**Description:**
Theoretical background behind the modal analysis of structures.
Modal analysis of structures.
Hull structure vibrations.

**Full-or-part-time:** 16h
Theory classes: 4h
Practical classes: 2h
Self study: 10h

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**GRADING SYSTEM**

The final mark of the course will be obtained with the following formula:

\[ N_{\text{final}} = 0.3 \cdot N_{\text{pp}} + 0.7 \cdot N_{\text{ec}} \]

Nfinal: Final Mark
Npp: Mark obtained in a mid-term test
Nec: Mark obtained from course projects and assignments

**EXAMINATION RULES.**

The student must complete at least the 75% of the course exercises and assignments to be evaluated of the course.
The student can have notes with equations, maximum five pages, in the course tests.
BIBLIOGRAPHY

Basic: