280710 - Propulsion and Auxiliary Systems

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2020
Degree: MASTER'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT MANAGEMENT (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 5  Teaching languages: English

Teaching staff

Coordinator: Castells Sanabra, Marcel·la
Others: Borén Altés, Clara

Opening hours

Timetable: Marcel·la Castells: By request at: mcastells@cen.upc.edu
Clara Borén: By request at: cboren@cen.upc.edu

Degree competences to which the subject contributes

Basic:
CB6. Possess knowledge and understanding that provide a basis or opportunity to 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.
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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.

Specific:
CE10-MNGTM. Coneixement avançat de la hidrodinàmica per a la seva aplicació a l’optimització de sistemes de
càrregues i capacitat per realitzar anàlisis d’optimització dels sistemes a bord.

Generical:
CG15-MNGTM. (ENG) Capacidad para resolver problemas complejos y tomar decisiones con responsabilidad sobre
bases científicas y tecnológicas en el ámbito de su especialidad
CG19-MNGTM. Capacit per desenvolupar els coneixements per a l’anàlisi i interpretació de mesuraments, càlculs,
valoracions, taxacions, peritatges, estudis, informes i documents tècnics en l’àmbit de la seva especialitat

Transversal:
CT1. ENTREPRENEURSHIP AND INNOVATION: Knowing and understanding the organization of a company and the
sciences that govern the activity; be able to understand the business rules and relationships between planning,
industrial and commercial strategies, quality and profit.
Know and understand the mechanisms that scientific research is based, as well as the mechanisms and instruments of
transfer of results between different socio-economic actors involved in the processes of R + D + i.
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.
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.

Teaching methodology
MD1. Lectures
MD3. Cooperative learning
MD4. Self study by solving exercises
MD5. Learning based in problems / projects

Learning objectives of the subject
Acquire a basic knowledge of engines and auxiliary ship systems as well as ship resistance calculation and ship power and
ship fuel consumption.

On the other hand, one of the objectives of this subject is provide the knowledge, understanding and proficiency of the
competency "Operate remote controls of propulsion plant and engineering systems and services", competency required
and defined in Section A-II/2-11 (Mandatory minimum requirements for certification of masters and chief mates on ships
of 500 gross tonnage or more) of the Seafarers' Training, Certification and Watchkeeping (STCW) International Code.

This competence will be partially evaluated thought the simulator in accordance of STCW Code.
# Study load

<table>
<thead>
<tr>
<th>Total learning time: 45h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>100.00%</th>
</tr>
</thead>
</table>

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## Content

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Learning time</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ship Resistance</td>
<td>The resistance of ships can be predicted by several methods. This chapter will explain different kind of resistances and their influence on the final resistance of the ship.</td>
<td>33h</td>
<td>12h</td>
<td>21h</td>
</tr>
<tr>
<td>2. Types of power in ships and efficiencies</td>
<td>When a ship generates a certain power within the Engine Room, this power will be transmitted along the propeller shaft and eventually to the tips of the propeller blades. This chapter shows the powers between the Engine Room and the propeller tips (Effective power, thrust power, delivered power, shaft power, brake power and indicated power) and will analyse losses of power enroute.</td>
<td>17h</td>
<td>5h</td>
<td>12h</td>
</tr>
<tr>
<td>3. Ship Trails and Fuel consumption</td>
<td>This chapter will calculate the ship trails, the types of fuel consumption (hour, mile and CV-hour) and the concepts of endurance and economical speed.</td>
<td>8h</td>
<td>3h</td>
<td>5h</td>
</tr>
<tr>
<td>4. Marine Propulsion Systems</td>
<td>This chapter will describe the operating principles of marine power plants (this knowledge is necessary in accordance with STCW Code A-II/2-11.1) and the general knowledge of marine engineering terms (in accordance with STCW Code A-II/2-11.3)</td>
<td>17h</td>
<td>6h</td>
<td>11h</td>
</tr>
<tr>
<td>Chapter 5. Ship's auxiliary systems</td>
<td>Learning time: 25h</td>
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<td></td>
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<td></td>
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<tr>
<td>Description:</td>
<td>Guided activities: 9h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self study: 16h</td>
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</tbody>
</table>

Ships' auxiliary systems knowledge will be described in this chapter (this knowledge is necessary in accordance with STCW Code A-II/2-11.2).

<table>
<thead>
<tr>
<th>Chapter 6. Ship weather routing design and optimization</th>
<th>Learning time: 25h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Guided activities: 9h</td>
</tr>
<tr>
<td></td>
<td>Self study: 16h</td>
</tr>
</tbody>
</table>

This chapter is oriented to provide skills for ship routing design and optimization (using SIMROUTE® software) to assess the impact of the meteo-oceanographic variables (such as wind, waves or currents) on ship navigation and to highlight the relevance of ship routing in terms of sailing time, fuel consumption and harmful emissions for the environment.
Qualification system

The final score is the sum of the following partial grades:

\[ N_{\text{final}} = 0.25N_{\text{pf}} + 0.25N_{\text{pp}} + 0.50N_{\text{ac}} \]

- \( N_{\text{final}} \): Final Score
- \( N_{\text{pf}} \): score of final exam
- \( N_{\text{pp}} \): score of partial exam
- \( N_{\text{ac}} \): score of the continuous assessment

The partial and final exams consist of questions (long and short answers) associated to the course learning objectives, concerning knowledge or comprehension and of practical exercises.

The continuous assessment (0.5) is the result of the following assessment activities:

\[ N_{\text{ac}} = 0.2N_{\text{ex}} + 0.15N_{\text{pra}} + 0.15N_{\text{ti}} \]

- \( N_{\text{ex}} \): Exercises
- \( N_{\text{pra}} \): Engine room simulator practices
- \( N_{\text{ti}} \): assignments and reports

The continuous assessment consists of different exercises and tasks carried out during the course. This type of assessment also includes tests. The assignments and reports can be individual or cooperative activities. These assignments include an oral presentation.

Examination and assessment of evidence of competence A-II/2-11 will be obtained from approved engine room simulator training.

Criteria of evaluate competence A-II/2-11: Plant, auxiliary machinery and equipment is operated in accordance with technical specifications and within safe operating limits at all times.

Regulations for carrying out activities

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

Basic:


Complementary:


Others resources:

Computer material

Matlab Software (MathWorks)

Resource