Course guide
280710 - 280710 - Propulsion and Auxiliary Systems

Last modified: 27/05/2025

Unit in charge:	Barcelona School of Nautical Studies
Teaching unit:	742 - CEN - Department of Nautical Sciences and Engineering.

Degree:	MASTER'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT MANAGEMENT (Syllabus 2016). (Compulsory subject).

Academic year: 2025   **ECTS Credits:** 5.0   **Languages:** English

LECTURER

Coordinating lecturer:	CLARA BOREN ALTES
Others:	Segon quadrimestre: CLARA BOREN ALTES - MNGTM MARCEL·LA CASTELLS SANABRA - MNGTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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. Capacitat 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.
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.

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

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

Type	Hours	Percentage
Self study	80,0	64.00
Hours large group	45,0	36.00

Total learning time: 125 h

CONTENTS

Chapter 1. Ship Resistance

Description:
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.

Full-or-part-time: 33h
Guided activities: 12h
Self study : 21h

Chapter 2. Types of power in ships and efficiencies

Description:
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 th 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.

Full-or-part-time: 17h
Guided activities: 5h
Self study : 12h

Chapter 3. Ship Trails and Fuel consumption

Description:
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.

Full-or-part-time: 8h
Guided activities: 3h
Self study : 5h

Chapter 4. Marine Propulsion Systems

Description:
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 knowedlge of marine engineering terms (in accordance with STCW Code A-II/2-11.3)

Full-or-part-time: 17h
Guided activities: 6h
Self study : 11h

Chapter 5. Ship's auxiliary systems

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

Full-or-part-time: 25h
Guided activities: 9h
Self study : 16h

Chapter 6. Ship weather routing design and optimization

Description:
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.

Full-or-part-time: 25h
Guided activities: 9h
Self study : 16h

GRADING SYSTEM

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

$Nfinal = 0.35Npf + 0.35Npp + 0.30Nac$
Nfinal: Final Score
Npf: score of final exam
Npp: score of partial exam
Nca: 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 (0,3) is the result of the following assessment activities:

$Nac = 0,15 Npra + 0,15Nti$
Nex: Exercises
Npra: Engine room simulator practices
Nti: 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.

EXAMINATION RULES.

- 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.

BIBLIOGRAPHY

Basic:
- Barrass, C.B. Ship design and performance for masters and mates. Oxford: Elsevier, 2004. ISBN 0750660007.
- Derret, D.R ; Barrass, C.B. Ship stability for masters and mates. 7 th ed. Amsterdam: Elsevier, 2013. ISBN 9780080970936.
- Master and chief mate : IMO model course ; 7.01. London: International Maritime Organization, 2014. ISBN 9789280115819.
- Engine room simulator. IMO model course ; 2.07. London: International Maritime Organization, 2017. ISBN 9789280116762.

Complementary:
- Molland, Anthony F. ; Turnock, Stephen R. Marine rudders and control surfaces [on line]. Oxford: Elsevier, 2007 [Consultation: 01/09/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780750669443/marine-rudders-and-control-surfaces. ISBN 9780750669443.
- Simpson, Andrew. Manual del motor diésel: enseñanzas y consejos de especialistas. Madrid: Tutor, 2007. ISBN 9788479026639.
- Bonilla de la Corte, Antonio. Construcción naval y servicios. Vigo: San José, 1984. ISBN 843982629X.

RESOURCES

Computer material:
- Matlab Software (MathWorks). Resource
- Wärtsilä Transas Techsim 5000. Engine Room Simulator