Course guide
280652 - 280652 - Propulsion

Last modified: 09/10/2023

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).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOEL JURADO GRANADOS

Others: Primer quadrimestre:
JOEL JURADO GRANADOS - GTM
ARNAU LLOANSÍ COLOM - GTM

REQUIREMENTS

It is advisable to have previously taken the subject 280645-Fluid Mechanics

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
GTM.CE31. Knowledge of marine propulsion and capacity for calculation, selection, installation and maintenance.

Generical:
GTM.CG9. ABILITY TO SHAPE, MANAGE AND IMPLEMENT COMPLEX SYSTEMS IN THE FIELD OF MARINE ENGINEERING. Ability to design, management and implementation of processes, systems and / or services in the field of marine engineering, including the development of projects in the field of specialization, knowledge of basic materials and technologies, decision making, the management of the activities under the project, conducting measurements, calculations and valuations, managing specifications, regulations and mandatory standards, assessment of the social and environmental impact of technical solutions, economic valuation and resource human and material involved in the project, with a systematic and inclusive vision.

ENG) CG9. ABILITY TO SHAPE, MANAGE AND IMPLEMENT COMPLEX SYSTEMS IN THE FIELD OF MARINE ENGINEERING. Ability to design, management and implementation of processes, systems and / or services in the field of marine engineering, including the development of projects in the field of specialization, knowledge of basic materials and technologies, decision making, the management of the activities under the project, conducting measurements, calculations and valuations, managing specifications, regulations and mandatory standards, assessment of the social and environmental impact of technical solutions, economic valuation and resource human and material involved in the project, with a systematic and inclusive vision.

STCW:
ME.1. A-III/1-1. Function: Marine engineering at the operational level
ME.2. A-III/1-1.4 Operate main and auxiliary machinery and associated control systems
ME.3. A-III/1-KUP 1.4.1.5 Basic construction and operation principles of machinery systems, including: .5 shafting installations, including propeller
ETO.1. A-III/6-1. Function: Electrical, electronic and control engineering at the operational level
ETO.2. A-III/6-1.1 Monitor the operation of electrical, electronic and control systems
ETO.3. A-III/6-KUP 1.1.1.3 Basic understanding of the operation of mechanical engineering systems, including: .3 steering systems

TEACHING METHODOLOGY

Lectures and resolution of problems. Exercises proposed by the teacher. Individual and team works. Tutorials.

LEARNING OBJECTIVES OF THE SUBJECT

Learn the procedures to select a marine propeller.
Understand the different propulsive systems nowadays and their needs. Then student must be able to apply the knowledge learned to assemble and maintenance of marine propellers and their propulsive system. Discern the diffferent propulsive solutions.
Make basic calculus of propeller design. Understand the cavitation phenomenon, problems involved and solutions to make. The student should be able to choose a main engine faccording to the needs and requirements of the vessel.
Another purpose of this subject is give to the students the knowledge, understanding and aptitude of the competence of the Annex III of the Standards of Training, Certification and Watchkeeping Convention (STCW), regarding the item 11.2: Naval Construction and Ship Theory, and 11.7: Elementary Knowledge of the Main Structural Elements and the Correct Nomenclature of the Diverse Components.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	14,0	12.44
Guided activities	4,0	3.56
Hours large group	27,0	24.00
Self study	67,5	60.00

Total learning time: 112.5 h

CONTENTS

Lesson 1. Introduction to hydrodynamics. Components of the drag resistance.

Description:
Components of the drag resistance. Froude's theory.
Viscous drag, wave drag and other components.
Different types of vessels: conventional and non conventional vessels.

Full-or-part-time: 22h 15m
Theory classes: 11h 15m
Guided activities: 1h
Self study : 10h

Lesson 2. Introduction to propellers. Fundamentals of propellers.

Description:
Introduction: parts of hte propulsive machinery. Propeller geometry.
Fundamentals: momentum theory, circulation theory and blade element theory.

Full-or-part-time: 22h 15m
Theory classes: 11h 15m
Guided activities: 1h
Self study : 10h

Lesson 3. Propeller tests. Cavitation study.

Description:
Open-water test, autopropulsive test.
Cavitation: phenomenon, reason and ways to appear, effects for the propeller, prevention.

Full-or-part-time: 22h 15m
Theory classes: 11h 15m
Guided activities: 1h
Self study : 10h

Lesson 4. Propellers projects. Choosing a main engine.

Description:
Systematic series, optimal diameter, optimum speed.
Types of propellers: controllable pitch propellers, waterjet, vertical axis propeller, supercavitants, pods.
Study of the propulsive systems and its elements. operation, maintenance. Problems arrised in propulsive systems and their solutions.

Full-or-part-time: 23h 15m
Theory classes: 11h 15m
Guided activities: 2h
Self study : 10h

GRADING SYSTEM

CONTINUOUS EVALUATION
Ncourse=0.40*P1+0.40*P2+0.20*Nt

Nt: marks of assignments done in groups and individually.
P1: first test. Lectures 1 and 2 will be evaluated.
P2: second test. Lectures 3 and 4 will be evaluated. This test will be done the last day of the course.
Final test: Those students that want improve their marks in any part of the P1 and P2 can do the final exam. The mark in those parts evaluated in the final exam, will be the final mark for each part.

REEVALUTATION:
The reevaluation will be a written exam that comprises all the concepts seen during the course.

EXAMINATION RULES.

The tests during the course are divided into theoretical concepts and exercises.
The final exam of January makes average with the marks of the assignments. In the reevaluation exam, the assignment mark does not count for the final qualification.

BIBLIOGRAPHY

Basic:
- Carlton, J.S, (John S.). Marine propellers and propulsion [on line]. 4tn ed. Oxford: Butterworth-Heinemann, 2019 [Consultation: 13/11/2023]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780081003664/marine-propellers-and-propulsion?via=ihub=. ISBN 9780081003664.
- Bertram, Volker. Practical ship hydrodynamics [on line]. Amsterdam; Boston: Butterworth-Heinemann, 2012 [Consultation: 10/10/2023]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780080971506/practical-ship-hydrodynamics. ISBN 128322481X.
- Rawson, K. J; Tupper, E.C. Basic ship theory [on line]. 5th ed. Boston: Butterworth-Heinemann, 2001 [Consultation: 10/10/2023]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780750653985/basic-ship-theory. ISBN 0750653973.
- Principles of naval architecture. Vol. 2, Resistance, propulsion and vibration. 2nd revision. Jersey City, NJ: The Society of Naval Architects and Marine Engineers, 1988-1989. ISBN 0939773015.
- Baquero, Antonio. Resistencia y propulsión del buque : hidrodinámica del buque I. Madrid: ETSIN, 2015.

Complementary:
- International Maritime Organization. Electro-technical officer. IMO model course 7.08. London: IMO, 2014. ISBN 9789280115802.