Course guide
280667 - 280667 - Propulsion

Last modified: 27/05/2024

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

Degree: BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 7.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOEL JURADO GRANADOS

Others: Primer quadrimestre:
JOEL JURADO GRANADOS - DT, GESTN, MUENO
ARNAU LLOANSÍ COLOM - DT, GESTN, MUENO

REQUIREMENTS

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

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of methods of design of naval propulsion 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.

STUDY LOAD

Type	Hours	Percentage
Self study	112,5	60.00
Hours large group	75,0	40.00

Total learning time: 187.5 h

CONTENTS

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

Description:
Components of the drag resistance. Froude's theory.
Viscous drag resistance: flat plane, frictional lines, form factor, viscous pressure drag, boundary layer separation, form influences, rugosity.
Wave making drag resistance: wave system related to the ship, limited depth, lateral restriction, wave pattern.
Other components: appendages drag resistance, aerodynamic drag resistance.

Full-or-part-time: 15h
Theory classes: 15h

Lesson 2: Tests with models. Vessel design

Description:
Tests with models: towing tanks, scale effects, correlation methods.
Vessel design: systematic series, influences of the shape, non-conventional vessels.
Methods used nowadays to design ships.

Full-or-part-time: 15h
Theory classes: 15h

Lesson 3: Introduction to propellers. Fundamentals of propellers.

Description:
Itroduction: Elements of the propulsion machinery. Geometry of the propeller.
Fundamentals: Momentum theory, circulation theory, blade element theory.

Full-or-part-time: 15h
Theory classes: 15h

Lesson 4: Tests with propellers. Study of the cavitation.

Description:
Open-water tests: fulfilment of test, purpose of the test.
Autopropulsive test: Fulfilment of the test, purpose of the test, propeller-hull interaction, study of the wake.
Cavitation: Phenomenon, reasons and ways to appear, effects to the propeller, prevention.

Full-or-part-time: 15h
Theory classes: 15h

Lesson 5: Propeller projects. Choosing the main engine

Description:
Systematic series, optimal diameter, optimum speed.
Different types of propellers: controllable pitch propllers, waterjet, vertical axis, cavitation propellers, pods.

Full-or-part-time: 15h
Theory classes: 15h

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. Hydrodynamics and drag resistance lectures will be evaluated.
P2: second test. Propeller lectures 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:
- 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 9780750653967.
- 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.
- Carlton, J. S (John S.). Marine propellers and propulsion [on line]. 4th 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]. 2nd ed. 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.