Course guide
280810 - 280810 - Design of Sailing Yatchs

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 NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Optional subject).

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

LECTURER

Coordinating lecturer: Segon quadrimestre:
MASSO DUXANS, MARIA - Grup: MUENO

Others: Maria Massó Duxamps

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
ENO_CEe1-1. Knowledge of the existing regulations that regulate the project of pleasure and competition boats (specific competence of the specialty in Design of Yachts and Recreational Boats)
ENO_CEe1-2. Ability to design pleasure and competition boats (specific competence of the specialty in Yacht and Recreational Boat Design)
ENO_CEe1-4. Ability to analyze the structural behavior and optimize the structure of pleasure and competition boats (specific competence of the specialty in Yacht and Recreational Boat Design)
ENO_CEe1-7. Knowledge of the materials used in the construction of pleasure boats. Knowledge of your working conditions and maintenance requirements. Knowledge of the mechanical behavior of these materials and their failure modes (specific competence of the specialty in Design of Yachts and Pleasure Boats)

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.
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 classes and practical classes

LEARNING OBJECTIVES OF THE SUBJECT

Capacity to project sailing yachts
Knowledge of advanced Naval hydrodynamics
Knowledge of the differents parts of the sailing yacht structure and the influence between the parts into the dessing process.
Knowledge of the different materials for each part of the structure

STUDY LOAD

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

Total learning time: 125 h

CONTENTS

1. Sailing yacht design methodology

Description:
Sailing yacht design methodology: Spira'ls design

Related activities:
to design a sailing yacht

Full-or-part-time: 7h
Theory classes: 2h
Guided activities: 1h
Self study : 4h

2. Preliminary Considerations

Description:
Preliminary considerations:
Cruise or regatta
Main dimensions
Design relationships
Cost
The optimal design

Specific objectives:
Raise the key points when starting the design of a sailing boat

Related activities:
To design a sailing yacht

Full-or-part-time: 8h
Theory classes: 3h
Guided activities: 1h
Self study : 4h

3. Hydrostatics and Stability

Description:
Hydrostatic and stability:
Hydrostatic curves
Bonjean curves
Initial stability
Stability at wide angles
Dynamic Stability
Stability criteria depending on the design category
STIX

Specific objectives:
That the student is able to establish the stability criteria that the boat must meet based on its dimensions and design category, and make the calculations.

Related activities:
TO design a sailing yacht

Full-or-part-time: 11h
Theory classes: 4h
Guided activities: 3h
Self study : 4h

4. Hull desing

Description:
Hull desing:
Forces and moments acting on the hull.
Components of resistance.
Calculation of resistance.
Influence of the main dimensions on the resistance.
Aspects of seakeeping.
Statistics.
State of the art.

Specific objectives:
Learn the important aspects related to the design of the sailboat hull

Related activities:
To design a saling boat

Full-or-part-time: 16h
Theory classes: 6h
Guided activities: 6h
Self study : 4h

5. Keel and rudder desing

Description:
Keel and rudder desing:
Flow around wing profiles.
Definition of the plane of forms.
Classical profile theory.
Bottom border shape.
Special configurations.
Lift and induced drag.
Evaluation of the configurations.
Most used profiles.
Influence of profile deviation.
Statistics for the keel and rudder area.
State of the art.

Specific objectives:
To obtain the knowledge to make the design of the appendages of the sailboat

Related activities:
To design a saling boat

Full-or-part-time: 16h
Theory classes: 6h
Guided activities: 6h
Self study : 4h

6. Sail and rigging desing

Description:
Sail and rigging desing: Calculation of the forces on the sails.
Types of navigation.
Flow around the candles.
Sails curvature.
Ways to reduce mast disturbance over the major.
Candlestick statistics.
State of the art.

Specific objectives:
Gain knowledge of candle design

Related activities:
To design a saling boat

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 5h
Self study : 4h

7. Balance

Description:
Balance: Effect of heel.
Center of lateral resistance.
Candle effort center.
Lead.
Rudder balance.

Specific objectives:
Understand the relationship between the forces acting on the hull and on the sails, and how they affect the maneuverability of the sailboat

Related activities:
To design a saling boat

Full-or-part-time: 8h
Theory classes: 3h
Guided activities: 1h
Self study : 4h

8. Rig and hull construction

Description:
Dimensioning of the different elements that make up the rigging

Related activities:
To design a saling boat

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 5h
Self study : 4h

9. Structural loads

Description:
Structural loads: Design loads.
Classification of loads.
Global loads.
Local loads.
Stress concentration.
Structural design criteria.
Scantling.

Specific objectives:
Learn the process of calculating the structure of a boat.

Related activities:
To design a saling boat

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 5h
Self study : 4h

10. Design evaluation

Description:
Design evaluation

Related activities:
To design a saling boat

Full-or-part-time: 14h
Theory classes: 3h
Guided activities: 3h
Self study : 8h

GRADING SYSTEM

A sailing yacht project will be developed in groups of two students. The mark of the project will represent 90% of the final mark.
A final exam will represent 10 % of the final mark.

BIBLIOGRAPHY

Basic:
- Larsson, Lars Olof; Eliasson, Rolf E.; Orych, Michal. Principles of yacht design. 4th ed. Camden: International Marine/McGraw-Hill Education, 2014. ISBN 9780071826402.
- Marchaj, Czeslaw A. Sail performance : theory and practice. London: Adlard Coles Nautical, 1996. ISBN 0713641231.
- Marchaj, Czeslaw A. Aero-hydrodynamics of sailing. 3rd ed. London: Adlard Coles Nautical, 2000. ISBN 0713650737.
- Fossati, Fabio. Aero-hydrodinamics and the perfomance of sailing yatchs. London: Adlard Coles Nautical, 2009. ISBN 9781408113387.

RESOURCES

Other resources:
Maxsurf, Rhinoceros