Course guide
280615 - 280615 - Ship Theory

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 NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: MARCEL·LA CASTELLS SANABRA

Others: Segon quadrimestre:
MARCEL·LA CASTELLS SANABRA - GNTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge, use and application of the ship from the principles of the theory of the ship.

TEACHING METHODOLOGY

Receive, understand and synthesize knowledge.
Solve problems.
Develop the reasoning and critical thinking.
Incorporate the gender perspective.

LEARNING OBJECTIVES OF THE SUBJECT

Reach a good understanding of the principles of buoyancy and stability of the vessel. The student begins to calculate weight movements, stability and vessel drafts.

On the other hand, one of the objectives of this subject is provide the knowledge, understanding and proficiency of the competency "Maintain seaworthiness of the ship"(A-II/1-13), and part of the competency "Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes"(A-II/1-10), competencies required and defined in Section A-II/1 (Mandatory minimum requirements for certification of officers in charge of a navigational watch on ships of 500 gross tonnage or more) of the Seafarers' Training, Certification and Watchkeeping (STCW) International Code.

This course is included in the first UPC Gender and Teaching Project whose main aim is to incorporate the gender perspective in diferent degree courses.

STUDY LOAD

Type	Hours	Percentage
Hours large group	60,0	40.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Chapter 1. Definitions

Description:
Ship characteristics. Reference lines. Laws of flotation. Buoyance. Displacement. Tonnage. General dimensions. Drafts. Form coefficients. Situation of a point in the ship. Hydrostatic Curves.

Understanding of the fundamentals of watertight integrity (this knowledge is necessary in accordance with Table A-II/1-13.1.3 of STCW Code)

Full-or-part-time: 16h
Theory classes: 6h
Self study : 10h

Chapter 2. Approximate methods to calculate buoyancy and stability.

Description:
Calculation of areas, moments, centers of gravity, inertia and volumes. Method of trapezoids and the Simpson's first rule.

Full-or-part-time: 26h
Practical classes: 6h
Guided activities: 10h
Self study : 10h

Chapter 3. Tonnage and maximum load lines.

Description:
Definition of tonnage. Moorsom system. IMO system. Shelter-Deck Ship. Maximum load lines. Zones and seasonal periods. Maximum permissible drafts.

Full-or-part-time: 13h
Theory classes: 2h
Practical classes: 1h
Self study : 10h

Chapter 4. Drafts

Description:
Laws of flotation. Trim correction. Trim. Calculation of fore and aft trim. Calculation of fore and aft alteration. TPC and displacement curves. Effect of change of density on draft and trim. River problems.

Full-or-part-time: 14h
Theory classes: 2h
Practical classes: 2h
Self study : 10h

Chapter 5. Centre of Gravity

Description:
Weight movements. Using moments to find the center of gravity. TPC

Full-or-part-time: 14h
Theory classes: 2h
Practical classes: 2h
Self study : 10h

Chapter 6. Center of Buoyancy

Description:
Isocarenas and isoclines, definition. Properties of the center of buoyancy. Properties of the submerged volume curve.

Full-or-part-time: 14h
Theory classes: 2h
Practical classes: 2h
Self study : 10h

Chapter 7. Initial stability

Description:
Stability classification. Transverse metacenter, Metacentre height and transverse metacentric radius. Metacentric evolute. Longitudinal Metacentre and longitudinal metacentric radius. Initial stability. Calculation of heel. The inclining experiment. Initial longitudinal static stability.

Full-or-part-time: 18h
Theory classes: 6h
Practical classes: 2h
Self study : 10h

Chapter 8. Stability at large angles of inclination

Description:
ATWOOD formula. KN Curves. Free surfaces. Stability curves. Analyzing a statical stability curve.
Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment. (This knowlege is necessary in accordance with Table A-II/1-13.1 of STCW Code).

Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy. (This knowlege is necessary in accordance with Table A-II/1-13.2 of STCW Code).

Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship. (This knowlege is necessary in accordance with Table A-II/1-10.1 of STCW Code).

Full-or-part-time: 22h
Theory classes: 6h
Practical classes: 6h
Self study : 10h

Chapter 9. Dynamical stability

Description:
Definition and calculation. Stability criteria.

Full-or-part-time: 13h
Theory classes: 1h
Practical classes: 2h
Self study : 10h

GRADING SYSTEM

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

Nfinal = Npf 0.4 + Npp 0.4 +0.2 Nac

Nfinal: final score
Npf: final exam
Npp: partial exam
Nac: continuous assessment

Partial and final exam consists of some issues associated with the learning objectives of the course so that respects the knowledge and understanding concepts, and a set of application exercises. The continuous assessment consists of different activities cumulative and formative character, both individual and group, made during the course.

Criteria for evaluating STCW A-II/1.13 and STCW A-II/1.10 competences: The stability conditions comply with the IMO intact stability criteria under all conditions of loading. Actions to ensure and maintain the watertight integrity of the ship are in accordance with accepted practice.

The act of re-evaluation will be done through a final exam where all the course material will be assessed.

EXAMINATION RULES.

You can't pass the course if all work activities and continuous assessment are carried out and submitted.

If the student does not carried out partial and/or final exam, he or she will be considered as: Not Presented

In any case, the student can use any kind of predesigned form in controls or tests.

BIBLIOGRAPHY

Basic:
- Olivella Puig, Joan. Teoría del buque : flotabilidad y estabilidad [on line]. 2a ed. Barcelona: Edicions UPC, 1995 [Consultation: 16/06/2012]. Available on: http://hdl.handle.net/2099.3/36216. ISBN 8483014750.
- Olivella Puig, Joan. Teoría del buque : flotabilidad y estabilidad : problemas [on line]. Barcelona: Edicons UPC, 1994Available on: http://hdl.handle.net/2099.3/36372. ISBN 8476535562.
- Dáaz Fernández, Cesareo. Teoría del buque. 2a ed. Barcelona: L'autor, 1969.

Complementary:
- Alvariño, Ricardo; Azpíroz, Juan José; Meizoso, Manuel. El proyecto básico del buque mercante. 2a ed. Madrid: Colegio Oficial de Ingenieros Navales, 2007. ISBN 9788492175024.
- Mandelli, Antonio. Elementos de arquitectura naval. 3a ed. Buenos Aires: Alsina, 1986. ISBN 9505530269.
- Principles of naval architecture. 2nd revision. Jersey City, NJ: The Society of Naval Architects and Marine Engineers, 1988-1989. ISBN 0939773007.
- Acanfora, Maria; Cirillo, Antonio. "On the intact stability of a ship in head and following sea: an analysis of the dynamic roll angle

due to sudden heeling moments". Journal of marine science and technology [on line]. Vol. 22, Núm. 4, des. 2017, p. 734-746 [Consultation: 28/06/2019]. Available on: https://doi-org.recursos.biblioteca.upc.edu/10.1007/s00773-017-0446-x.