Ship Structures and Constructions

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SHIPMARTECH

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Ship Structures and Constructions

- 9 ECTS (225)
- Work load: 72 hours of frontal lessons + 153 self-study
- Prerequisites/ co-requisites:
  - Ship construction technology - ship buoyancy and stability - structural mechanics
- Bachelor course

Objectives

- Approach the student to the basis of ship structural design
- Present and classify the loads applied to the hull
- Provide the theoretical background for understanding standard calculations regarding hull girder and local structural members
- Introduce students to classification society rules on ship structural design

Intended Learning Outcome (ILO)

- Upon successful completion of this course, students will be able to:
  - distinguish between loads on ship structures and choose the proper structural scheme and method;
  - understand the limits of applicability of the methods and check qualitatively the obtained results;
  - read the classification society rules and understand the theory behind them.

Teaching and learning formats and methods

- Development is promoted through the following teaching and learning methods:
  - The student listens to the teacher lecture
  - The student attends the class presentations and participates in the discussions
  - The student discusses in class on the outcomes of true-false quizzes
  - The student attends the class exercises and learns by applying the studied methods.
  - The student completes at home the assignment tasks not concluded in class, supported by guidelines provided by the teacher
  - The student reads the teaching material supported also by audio-visual materials

Learning resources, readings, references

- A- Required books:
  - Ship Design and Construction SNAME 2003
  - RINA Rules, part B
  - Principles of Naval Architecture

- B- Recommended readings:
  - Global hull girder response by Varsta et al Pages 1-7
  - Ship structural design by Hughes

In addition to textbooks: lecture slides, guidelines for the assignment tasks, selected YouTube videos (links to you-tube videos are available within lecture slides)

Assessment

- Final mark is obtained as combination of the technical report and a written and an oral exam

Assessment tool	Mark
Course assignment report	30 %
Written exam	30 %
Oral exam	40 %
Total	100%

Lecture topics

- Loads on ship structures based on frequency (static vs dynamic) and on ship response (global vs local).
- Primary (hull girder), secondary and tertiary structural scheme
- Section moduli, stress and strain for the hull girder
- Hull girder loads and internal stresses in still water
- Hull girder loads and internal stresses in waves. Linear and non-linear quasi-static method
- Notes on strip theory
- Hull girder vibrations,
- Todd's Method for the estimation of two-nodes flexural natural frequency
- Yielding checks: direct approach vs IACS approach
- Ultimate strength check and ultimate bending moment
- Notes on torsional moments and buckling
- Local loads
- Isolated beam approach

Course assignments

- Student have to complete 8 assignment. The use of Excel is recommended.
- Each assignment has all necessary input data and support guidelines are provided
- The scope, the method and the outcomes of each assignment should be reported in a technical report

Course assignments

- Vertical shear and bending moment: Numerical solution of a simply supported beam
- Vertical shear and bending moment: Numerical solution of a floating pontoon
- Section moduli of a main section and calculation of the hull weight per unit length
- Vertical shear and bending moment and hull deflection: Numerical solution of a floating ship
- Application of the quasi-static method for wave loads on the hull girder
- Application of the Todd's method for the natural flexural (vertical) frequency of the hull girder, first mode.
- Calculation of the ultimate bending moment of a pontoon
- Yielding checks: by direct calculations vs rule formulas