

## Manoeuvring and Seakeeping Behaviour of Maritime Constructions (E055290)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**

**Study time 180 h**

**Course offerings and teaching methods in academic year 2023-2024**

A (semester 1)	English	Gent	lecture practical
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**Lecturers in academic year 2023-2024**

Delefortrie, Guillaume	TW15	lecturer-in-charge
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**Offered in the following programmes in 2023-2024**

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<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	6	A

**Teaching languages**

English

**Keywords**

waves, response of floating constructions in (ir)regular waves, steering, manoeuvring

**Position of the course**

Theoretical background and practical approach of the behaviour of floating and sailing constructions as a result of (regular and irregular) waves and internally or externally induced horizontal forces.

**Contents**

- Gravity waves: Irrotational wave motion: linear theory, Irregular waves, energy spectrum
- Response of floating constructions in regular waves: Introduction to radiation and diffraction problem for floating, stationary objects, Pitch, heave and roll motions of ships
- Response of floating constructions in irregular waves: Response spectrum, Statistical considerations, Applications
- Behaviour of ships in the horizontal plane: Directional stability and manoeuvrability, Forces acting on a manoeuvring ship hull, Control devices, External forces, Automatic course control, Unmanned navigation
- Manoeuvring in waves

**Initial competences**

This course builds on some learning outcomes of the course 'Introduction to maritime technology'

**Final competences**

- 1 Be capable of explaining the physical phenomena on which the motion response of a ship or another floating structure due to regular waves is based. Be capable of composing the mathematical representation of the heave, pitch and roll response of a ship to regular waves by means of linear wave theory and strip theory.
- 2 Describe and apply the characteristics and properties of an irregular seaway by means of (directional) wave spectra.
- 3 Derive, interpret and apply the mathematical formulation of the response spectrum of a ship or floating structure on an irregular sea. Calculate exceedance probabilities for undesired effects (slamming, shipping of water, ...).
- 4 Acquire insight into the non-linear aspects of the roll motion of ships. Explain the physical and mathematical background and describe the practical realisation of technical solutions for reducing the roll motion of ships.

- 5 Be able to apply seakeeping software for determining the response characteristics of ships or other floating structures to regular waves and for calculating exceedance probabilities for undesired effects in irregular seas.
- 6 Gain insight into the manoeuvring and steering behaviour of ships by means of linear theory. Explain and analyse the effect of the principal parameters determining the manoeuvring and steering behaviour of ships.
- 7 Explain and interpret the execution and results of standard manoeuvres.
- 8 Be able to explain the physical background and derive the mathematical formulation of the main hydrodynamic coefficients of the linear equations of motion for sway and yaw.
- 9 Be able to explain the physical background and the mathematical formulation of the hydrodynamic forces acting on a rudder. Distinguish the main types and realisations of rudders and other steering equipment for ships and their application ranges.
- 10 Be able to derive and interpret the mathematical background of autopilots for ships.
- 11 Gain insight into the mathematical modelling of a ship's manoeuvring behaviour for simulation purposes.
- 12 Determine the main rudder characteristics in a concept design phase.

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Excursion, Lecture, Practical

#### **Learning materials and price**

Course notes in English, estimated cost 30 EUR, to be acquired at VTK

#### **References**

#### **Course content-related study coaching**

Lecturer and assistant are available before and after the lectures. Additional contacts are possible after appointment or by e-mail

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Oral assessment, Written assessment open-book

#### **Examination methods in case of periodic assessment during the second examination period**

Oral assessment, Written assessment open-book

#### **Examination methods in case of permanent assessment**

Assignment

#### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

#### **Extra information on the examination methods**

During examination period:

- oral closed-book exam on theory, written preparation
- written open-book exam on exercises.

During semester: graded project reports. No assistance is provided during the second examination period.

#### **Calculation of the examination mark**

Oral closed-book exam during examination period: 50%

Written open-book exam during examination period: 25%

Project reports during semester: 25%.

The student can only pass for the entire course if:

- for each of the above mentioned items a mark of at least 5 on 20 is obtained
- for two of the above mentioned items a mark of at least 10 on 20 is obtained

If the above conditions are not met the final mark is the minimum of 9/20 and the above mentioned weighted result.

