GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

General Arrangement, Structural Arrangements and Construction of Marine Structures (E055030)

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 2)	Dutch	Gent	
B (semester 2)	English	Gent	lecture

Lecturers in academic year 2023-2024

Rigo, Philippe	TW15	lecturer-in-charge
Lataire, Evert	TW15	co-lecturer

Offered in the following programmes in 2023-2024	crdts	offering
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A

Teaching languages

Dutch, English

Keywords

Ships, offshore structures, shipbuilding, freeboard assessment, tonnage measurement, midship section, scantling

Position of the course

Increasing the basic technical know-how concerning marine structures, required for engineering staff in maritime organisations such as ship owners, harbour services, dredging companies and classification societies.

Contents

- Scantlings according to the rules of the classification societies: structural details for thin-walled structures subject to fatigue loads, longitudinal strength; influence of superstructures on longitudinal strength, midship section design according to the rules of the classification societies
- Shipyard practice: an outline

- Ship equipment: an outline
- Freeboard assessment and tonnage measurement
- A methodology for general design
- Special features of the general and structural design of specialized vessels: Tankers, bulk carriers, container ships, dredgers, tugs, fishing vessels,...

Initial competences

Introduction to marine technology, Mechanics of materials, Mechanics of structures, Turbo machinery, Piston machinery

Final competences

1 Master the terminology in relation to maritime constructions, structure and exploitation.
2 Description and naming of the relevant parts of maritime constructions.
3 To be able to explain the relationship between the load, the response and the strength of maritime constructions.
4 Gaining insights in the different failure mechanisms as a result of the load on a maritime construction.
5 Understand the calculation methodology for the design of basic parts and elements of maritime constructions.
6 To be able to explain the mathematical and scientifical basis in relation to used formulae in the design of a maritime construction.
7 Possess basic knowledge, required for the design, construction, control or exploitation of maritime constructions.
8 Assessment and estimation of the strength of parts and elements of a maritime construction.
9 Apply direct calculation, based on material strength, and the use of class rules for the design of maritime constructions.

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

Lecture, independent work

Extra information on the teaching methods

Lectures and guided project about the specific topics of the courses content, with the possibility of asking questions.
If possible, the lectures are supplemented with visits to relevant research institutions and companies.

Learning materials and price

Syllabus, price 20 EUR

References

- Scheepskennis (K. van Dokkum, Dokmar, Delfzijl 2001)
- Principles of Naval Architecture (SNAME, Jersey City, laatste editie)
- Mansour, A. E., Liu, D., Paulling, J. R., & Society of Naval Architects and Marine Engineers (U.S.). (2008). Strength of ships and ocean structures. Jersey City, N.J: Society of Naval Architects and Marine Engineers.

Course content-related study coaching

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment

Examination methods in case of periodic evaluation during the second examination period

Oral assessment

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During examination period: oral closed-book exam. During semester: graded project reports.

Calculation of the examination mark

Specific conditions: Non periodical evaluation: 33%
If for one of the abovementioned items a mark of less than 5 on 20 is obtained, the student cannot pass for the entire course. The final mark is in that case the minimum of 9/20 and the abovementioned weighted result.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Computational Fluid Dynamics (E045240)

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 2)	English	Gent	lecture seminar
B (semester 2)	Dutch	Gent	
C (semester 2)	English	Gent	lecture seminar

Lecturers in academic year 2023-2024

Degroote, Joris	TW08	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
European Master of Science in Nuclear Fusion and Engineering Physics	6	A
Master of Science in Chemical Engineering	6	B
Master of Science in Chemical Engineering	6	A
Master of Science in Electromechanical Engineering Technology	4	C

Teaching languages

Dutch, English

Keywords

Fluid Mechanics, Computational Fluid Dynamics, CFD

Position of the course

An introduction to the equations and computational techniques in fluid mechanics.
The full version of this course is 6 ECTS, but it is also offered as a partim version of 4 ECTS, as an elective course in the programmes Master of Science in Electrical Engineering Technology and Master of Science in Electromechanical Engineering Technology (course offering C). In this partim version we focus on the practical use of computational techniques in fluid mechanics.

Contents

Theoretical background (only for the course offerings of 6 ECTS; voluntary participation in the theory lectures without evaluation in the course offering of 4 ECTS):

- Flow equations: conservation equations and state equations, mathematical character of flow equations
- Turbulence models for viscous flows: transition and turbulence, Reynolds averaging, turbulent viscosity, two-equation eddy viscosity models, RSM, LES and DNS
- Grid generation and spatial discretisation: structured and unstructured grids, cell-centred and vertex-based finite volume methods
- Finite volume methods for diffusion and convection-diffusion: steady state diffusion, steady state convection-diffusion, central and upwind discretisations
- Higher order discretisation of convection-diffusion: quadratic upwind discretisation, non-linear upwind discretisation: TVD-schemes
- Pressure-velocity coupling: pressure oscillations, momentum interpolation, pressure correction algorithms
- Solution methods for systems of equations: direct methods, iterative methods, multigrid formulation
- Unsteady flows: implicit and explicit time stepping schemes
- Heat transfer, rotating domains, multiphase flow, fluid-structure interaction

Exercises using CFD tools (for all course offerings):

- Calculate mixing of a cold and hot flow in a tube
- Compare discretisation schemes
- Calculate the wake of a cylinder
- Compare turbulence models for a dump diffusion
- Calculate subsonic, transsonic and supersonic flow around an airfoil
- Compare techniques for rotating machines
- Calculate how a valve opens

Initial competences

Transport phenomena

Final competences

1 Describe selected techniques in computational fluid dynamics (applicable for the course of 6 ECTS)
2 Select appropriate numerical techniques and settings for a flow problem (applicable for the full version of 6 ECTS and the partim version of 4 ECTS)

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

Lecture, seminar, independent work

Extra information on the teaching methods

- Course of 6 ECTS: lecture, project, seminar: practical PC room classes
- Partim version of 4 ECTS: lecture (recommended), project, seminar: practical PC room classes

Learning materials and price

- Slides and book
- Tutorials with Fluent and OpenFOAM

References

- An Introduction to Computational Fluid Dynamics: The Finite Volume Method (2nd edition), H. Versteeg and W. Malalasekra, Pearson Prentice Hall, 2007.

Course content-related study coaching

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic evaluation during the second examination period

Written assessment with open-ended questions

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Version of 6 ECTS:

- Periodic (end-of-term) evaluation: written examination with closed book. Second evaluation: written examination with closed book.
- Permanent evaluation: assessment of project report. Frequency: 1 report.

For the partim version of 4 ECTS:

- Permanent evaluation: assessment of project report. Frequency: 1 report.

Calculation of the examination mark

Version of 6 ECTS:

- Periodic (end-of-term) evaluation 50%, permanent evaluation 50%
- Special condition: If the student scores less than 8/20 for at least one component of the assessment, a pass mark for the course unit in question is not possible. If the final mark does turn out to be a 10/20 or more, this will be reduced to the highest non-deliberative mark, i.e. 7/20.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Composites (E900069)

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

Credits 6.0 **Study time 180 h**

Course offerings in academic year 2023-2024

A (semester 1)	English	Gent
B (semester 1)	Dutch	Gent

Lecturers in academic year 2023-2024

Van Paepegem, Wim	TW11	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Sustainable Materials Engineering	6	A
Master of Science in Engineering: Architecture (main subject Architectural Design and Construction Techniques)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Industrial Engineering and Operations Research (main subject Manufacturing and Supply Chain Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Industrial Engineering and Operations Research (main subject Transport and Mobility Engineering)	6	A
Master of Science in Engineering: Architecture (main subject Urban Design and Architecture)	6	A
International Master of Science in Sustainable and Innovative Natural Resource Management	6	A
Master of Science in Electromechanical Engineering Technology	6	A
Master of Science in Materials Engineering	6	A, B
Master of Science in Sustainable Materials Engineering	6	A
Exchange Programme Architecture	6	A

Teaching languages

Dutch, English

Keywords

Composites, fibre reinforced plastics, technology, fabrication, sandwiches, mechanical behaviour, non-destructive characterisation

Position of the course

This course deals with an introduction to the technology and the mechanics of fibre reinforced materials. In general, products made of those materials are quite different from traditional isotropic materials, such as metals and plastics.
The course treats on the technology, the basic mechanics, and some specific aspects of fibre reinforced materials.
As this course is also meant for other disciplines than pure materials science, it mainly focuses on the mostly used fibre reinforced plastics.

Contents

- Technology of fibre reinforced materials: fibre reinforced composites, review of reinforcing fibres and matrices, properties and applications, fabrication processes, sandwich constructions
- Stiffness and strength: micromechanics of a layer, macromechanics of a layer, classical laminate theory, interlaminar stresses
- Mechanical behaviour and testing: fracture and damage mechanics, static testing, fatigue, impact, non-destructive testing and characterisation
- Design aspects

Initial competences

Mechanics of materials, basic material science

Final competences

1 To understand and to know basic terminology of the technology and the manufacturing of composite materials
2 To be able to deal with the mechanics and the design of layered, orthotropic materials
3 To be able to handle in a judicious way orders of magnitude and estimations of material properties
4 To be able to make a founded choice of a candidate material (class) for a specific application
5 To be able to calculate the stiffness and strength of laminates under simple load situations

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

Lecture, seminar, independent work, practical

Extra information on the teaching methods

Classroom lectures; Lab sessions; Computer-assisted problem solving

Learning materials and price

Detailed as well as supporting lecture slides are at the students' disposal through the electronic learning environment.
For the PC room exercises the student has access to a free laminate calculation tool.

References

- An introduction to composite materials, Derek Hull, Cambridge Solid State Science Series, ISBN 0 521 28392
- Materials Science and Engineering an introduction, W.D. Callister Jr.

Course content-related study coaching

Evaluation methods

end-of-term assessment

Examination methods in case of periodic evaluation during the first examination period

Written assessment

Examination methods in case of periodic evaluation during the second examination period

Written assessment

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

During examination period: written examination with closed books

Calculation of the examination mark

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Construction Techniques (E056600)

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

Credits 3.0 **Study time** 90 h

Course offerings and teaching methods in academic year 2023-2024

A (semester 2)	Dutch	Gent	
B (semester 2)	English	Gent	lecture excursion seminar
C (semester 2)	English	Gent	lecture practical seminar

Lecturers in academic year 2023-2024

De Waele, Wim	TW08	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	3	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	3	B
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	3	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	3	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	3	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	3	B
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	3	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	3	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	3	A
Master of Science in Electromechanical Engineering Technology	3	C

Teaching languages

Dutch, English

Keywords

Joining techniques, welding, mechanical joining, adhesive bonding

Position of the course

The students are getting insight in different welding techniques, related processes (eg. cutting) and other joining techniques (eg. adhesive bonding) for metals. Besides the physical principles, the technological aspects of the different joining techniques are studied as well as the practical implications on the design of the joint. In addition, attention is given to the strength calculation (static and fatigue) of weld joints.
This course is both offered to students from engineering programmes (course offerings A and B) as well as to studens engineering technology (course offering C).

Contents

Lectures

- Welding and allied processes:
  - General principles, advantages and disadvantages, quality control
  - Structural aspects of weldments
  - Weldability and problems during welding
  - Fusion welding: gas flame welding, electric arc welding, electric resistance welding, ...
  - Solid-state pressure welding: friction welding, explosion and pulse welding, ...
  - Fusion pressure welding: electric arc and electric resistance
  - Cutting, gouging and cladding
  - Soldering and brazing
  - Laser welding and operations
- Adhesive bonding:
  - Principles, bonding process, types of adhesives, advantages and disadvantages
  - Load transfer and structural design

Coached exercises (only for students in the engineering programmes)

- Static strength calculations of welded joints
- Fatigue strength calculations of welded joints

Practicals (only for students in the engineering technology programmes)

- Fatigue strength calculations of welded joints
- Practical experience with electric arc welding

Initial competences

This course builds on certain learning outcomes of the course 'Mechanica van Materialen' (engineering programmes) or Materialen and Mechanica (engineering technology programmes)

Final competences

1 Understand the physical principles of joining techniques.
2 Describe the technological aspects of joining techniques.
3 List the advantages and disadvantages of joining techniques.
4 Know the applications of joining techniques.
5 Understand terminology specific to joining techniques.
6 Critically compare different joining techniques.
7 Select the most suited joining technique for a specific application.
8 Be aware of societal aspects (safety, economy, sustainability) specific to joining techniques.
9 Analyse and explain the load transfer in joints.
10 Constructive design of joints.
11 Recognize and remediate defects in joints.
12 Calculate the strength of joints.
13 Analyse, summarize and present scientific literature related to joining techniques (only for the engineering programmes).

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, seminar, practical

Learning materials and price

Course material available through the interactive education platform (presentations, movies, book).

References

Welding processes handbook, 2nd Edition, Ed. K. Weman, Woodhead Publishing, ISBN 978-0-85709-518-3, 2012

Course content-related study coaching

The lecturer is available before and after the lectures. A personal meeting is possible upon e-mail request.
Individual guidance during practicals (engineering technology programmes).

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment, written assessment open-book

Examination methods in case of periodic evaluation during the second examination period

Oral assessment, written assessment open-book

Examination methods in case of permanent evaluation

Peer and/or self assessment, assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Engineering programmes (course offering B):
Periodic evaluation:
- Theory: oral closed-book exam;
- Exercises: written exam with open book

Permanent evaluation:
- Presentation of a literature study (1st period: by a group of students; 2nd period: individual)
- Peer evaluation (only in 1st period)

Engineering technology programmes (course offering C):
Periodic evaluation:
- Theory: oral closed-book exam;
- Exercises: written exam with open book

Calculation of the examination mark

Engineering programmes: the final quotation is based on a weighted average of the scores obtained for theory (10/20), exercises (7/20) and microteaching (3/20).
Engineering technology programmes: the final quotation is based on a weighted average of the scores obtained for theory (10/20) and exercises (10/20).
If the student does not participate to the evaluation of one or more parts, he/she cannot pass this course. If the final score in this case would be 10/20 or more, the score is reduced to the highest unsuccessful score (9/20).

GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2022-2023

Introduction to Maritime Technology (E055045)

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

Credits 6.0 **Study time 180 h** **Contact hrs** 60.0 h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)	English	Gent	seminar: coached exercises	30.0 h
			lecture	30.0 h
B (semester 1)	Dutch	Gent	seminar: coached exercises	30.0 h
			guided self-study	30.0 h

Lecturers in academic year 2022-2023

Lataire, Evert	TW15	lecturer-in-charge

Offered in the following programmes in 2022-2023	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B
Master of Science in Industrial Design Engineering Technology	6	A

Teaching languages

Dutch, English

Keywords

Ships, shipping, ship stability, ship propulsion, ship motions, seakeeping, ship manoeuvring

Position of the course

Introduction to the maritime world, providing basic information on characteristics, construction, stability, propulsion and motions of ships. Thorough knowledge concerning hydrostatics and stability of floating structures and ships.

Contents

- Shipping as part of the logistics chain.: The role of shipowners, shipyards and classification societies.
- General description of the ship as a means of transport or as an implement.: Function and short description of some ship types: cargo ships, dredgers, tugs,...

- Ship structures: materials and construction systems.
- Hydrostatics and stability of floating structures: background; influence of free liquid surfaces and of hanging loads, applications (e.g. sheer-legs pontoon); IMO regulation (load line, tonnage, stability).
- Propulsion of ships (introduction): ship resistance; propulsion methods; propulsion machinery.
- Ship maneuvering by means of rudders and thrusters (introduction): fundamentals; standard maneuvers; maneuvering simulation; maneuvering in restricted waters.
- Motions of ships in waves (introduction): linear wave theory; fundamentals; motions in navigation channels; forces on and motions of moored ships.

Initial competences

Specific elements of the mathematics and physics courses from the bachelor's.

Final competences

1 Gain insight into hydrostatics and stability of floating structures.
2 Get acquainted with professional terminology concerning external characteristics, structure and primary members of maritime constructions.
3 Analyse the stability of floating structures, including the effects of free fluid surfaces, hanging weights, movable cargo.
4 Assess ship stability with respect to international conventions.
5 Distinguish the most important physical causes of a ship's resistance. Reason out the most important parameters on which a ship's resistance depends. Define and recognise the most usual technologies used for a ship's propulsion.
6 Reason out the manoeuvring behaviour of a ship. Distinguish the most important characterstics of a ship's steering equipment (rudder). Define the main techniques used to determine and evaluate a ship' s manoeuvring behaviour.
7 Get acquinted with the specific hydrodynamic behaviour of a ship in shallow and confined navigation areas.
8 Give an explanation for the dynamic behaviour of a floating structure in waves. Be able to use professional terminology with respect to the behaviour of floating structures in waves.
9 Describe the main players in the shipping world.
10 Analyse specific problems concerning hydrostatics and stability of ships and other floating structures.
11 Execute hydrostatic calculations and stability calculations for a ship by means of specialised software.

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

Guided self-study, lecture, seminar: coached exercises

Extra information on the teaching methods

Lectures, excercises and project about the specific topics of the courses content, with the possibility of asking questions.
If possible, the lectures are supplemented with visits to relevant research institutions and companies.
Due to Covid19, the education methods may differ from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Learning materials and price

Syllabus in English, price 20 EUR.

References

- Lewis, E. V., & Society of Naval Architects and Marine Engineers (U.S.). (1988). Principles of naval architecture. Jersey City: Society of Naval Architects and Marine Engineers.
- Mansour, A. E., Liu, D., Paulling, J. R., & Society of Naval Architects and Marine Engineers (U.S.). (2008). Strength of ships and ocean structures. Jersey City, N.J: Society of Naval Architects and Marine Engineers.
- Scheepskennis (K. van Dokkum, Dokmar, Delfzijl 2001)

Course content-related study coaching

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Open book examination, oral examination

Examination methods in case of periodic evaluation during the second examination period

Open book examination, oral examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During examination period: oral closed-book exam, written preparation; written open-book exam. During semester: graded project reports.

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.
Due to Covid19, the evaluation methods and the calculation of the examination mark may differ from the information displayed in the schedules and course details especially if one or more evaluations cannot be organised on campus or cannot be organised at all. Any changes will be communicated on Ufora.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

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

Lecturers in academic year 2023-2024

Delefortrie, Guillaume	TW15	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	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, interprete 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 efffect of the principal parameters determining the manoeuvring and steering behaviour of ships.

7 Explain and interprete 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 interprete 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

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment, written assessment open-book

Examination methods in case of periodic evaluation during the second examination period

Oral assessment, written assessment open-book

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

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.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Offshore Structures (E044666)

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

Credits 4.0 **Study time** 120 h

Course offerings and teaching methods in academic year 2023-2024

A (semester 2)	English	Gent	lecture	15.0 h
			project	20.0 h
			group work	10.0 h

Lecturers in academic year 2023-2024

Kortenhaus, Andreas	TW15	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Master of Science in Civil Engineering	4	A

Teaching languages

English

Keywords

Offshore structures

Position of the course

The goal of the course is allowing students to gain insight in all relevant engineering aspects of offshore techniques construction.

Contents

- Overview of offshore construction.
- Gravity structures, jacket construction, monopiles, ...
- Hydraulic forces (waves and currents) on offshore structures with clear distinction between singular structures (e.g. monopiles) and jacket structures.
- Offshore wind energy
- Ocean energy, mainly tidal- and wave energy
- Financial viability of offshore installations

Initial competences

Coastal engineering and Harbour construction, Geotechnics, Hydraulics

Final competences

1 CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy
2 INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problems related to offshore constructions; renewable energies
3 SKILLS: design of offshore structures

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

Group work, lecture, seminar

Learning materials and price

Syllabus, costs: -

References

- Boyle, G. (2004): Renewable Energy - Power for a sustainable future. Oxford, U.K.: Oxford University Press, 2nd edition, 452 p.
- EWEA (2013): Deep water - The next step for offshore wind energy. The European Wind Energy Association, 50 p.
- Journée, J.M.J.; Massie, W.W. (2001): Offshore hydromechanics. Delft University of Technology, 530 p.
- Kortenhaus, A.; Vanneste, D. (2013): Wave forces on slender cylindrical piles. Department of Civil Engineering, Lecture Notes for 'Offshore Structures', Ghent, Belgium, 26 p.
- Lykke Andersen, T.; Frigaard, P. (2007): Lecture notes for the course in 'Water wave mechanics'. Department of Civil Engineering, DCE Lecture Notes No. 16, Aalborg, Denmark, 111 p.
- Rabaut, D. (2013): Strucural design of offshore steel structures: self-elevating units. DEME Dredging, Environmental & Marine Engineering, Lecture Notes, Offshore Structures, Ghent University, Version 1.02, 47 p.
- Van der Tempel, J. (2006): Design of support structures for offshore wind turbines. Ph.D. thesis, *Delft University of Technology*, Delft, The Netherlands, 194 p.
- Vannuci, D. (2011): ORECCA project: Technologies - state of the art. 120 p.

Course content-related study coaching

The teaching staff is available to the students before and after the scheduled courses and via email.

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment open-book

Examination methods in case of periodic evaluation during the second examination period

Oral assessment open-book

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

Periodic evaluation (during examination period): oral open-book exam, written preparation.
Non-periodic evaluation (before examination period): evaluation of report on project assignments. Students submit the report before the start of the periodic evaluations, according to the terms announced during the lectures and via the electronic learning platform.
If not submitted the report in time, without a valid and timely communicated reason for it, then the student will receive a 0 for the nonperiodical evaluation. For the non-periodic evaluation, a second chance is only possible in modified form, if less than 10 in 20 was achieved.

Calculation of the examination mark

The periodic evaluation (oral exam) counts for 60% of the total, the non-periodic evaluation (project work) counts for 40% of the total.
If for one of both evaluations (exam or project work) less than 10 (in 20) is scored, then this part is counted for 70% and the other part for 30%.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Hydrostatics and Propulsion of Maritime Constructions (E055270)

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 2)	Dutch	Gent	seminar: coached exercises	12.5 h
			excursion	5.0 h
B (semester 2)	English	Gent	excursion	
			seminar	
			lecture	

Lecturers in academic year 2023-2024

Delefortrie, Guillaume	TW15	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B

Teaching languages

Dutch, English

Keywords

Advanced hydrostatics of floating objects, Ship resistance, Ship engines, Ship propulsion, Vibrations, Under water radiated noise

Position of the course

Theoretical background, practical applications and calculation methods concerning hydrostatics of flaoting structures: damage calculations, ship in contact with a bottom. Theoretical background and practical approach to the hydrodynamic aspects of resistance and propulsion of ships (with emphasis on screw propellers), and adverse effects due to propeller action.

Contents

- Hydrostatics of floating structures: damage calculations for ships.
- Hydrostatics of floating structures: contact with bottom.
- Ship resistance: Principles, Resistance components, Extrapolation methods, Selection of standard series and statistical methods, Influence of ship geometry
- Ship engines: principles, power and efficiency
- Ship propulsion: Propeller geometry, Propeller theory, Similarity laws, Propeller-hull interaction, Propeller design (propeller series), Special propulsion devices
- Adverse effects: Cavitation, Vibrations excited by propeller, propeller shaft, engines, sea state, under water radiated noise

Initial competences

This course builds on some learning outcomes of Introduction to maritime technology and of Transport phenomena

Final competences

1 Understand and analyse the physical background of the consequences of damage to a ship on hydrostatics and stability. Distinguish the regulatory principles on which the criteria for damaged ships are based.
2 Be capable to solve realistic problems concerning damage calculations of ships in a simplified way. Be capable of executing damage calculations by means of specialised software.
3 Be capable to solve realistic problems concerning floating structures supported by the bottom in a simplified way.
4 Distinguish and explain the different physical causes of ship resistance.
5 Derive how ship resistance can be determined by means of experimental techniques.
6 Apply empirical methods to approximate ship resistance.
7 Derive the power flow in the conversion from mechanical power to resistance power and define the efficiencies involved.
8 Be capable to identify the geometric characteristics of a screw propeller. Describe special propeller types and make distinction between their specific application range.
9 Explain the action of a screw propeller for ship propulsion by means of momentum theory, blade element theory and vortex theory.
10 Understand the characteristic behaviour of a propeller in open water and behind a ship, including terms as wake fraction and thrust deduction fraction.
11 Explain the propeller cavitation phenomenon and apply practical cavitation criteria.
12 Execute the concept design of a propeller by means of systematic propeller series.
13 Identify the hydrodynamic aspects of ship vibrations and underwater radiated noise.

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, seminar

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

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment, written assessment open-book

Examination methods in case of periodic evaluation during the second examination period

Oral assessment, written assessment open-book

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During examination period:
- oral closed-book theory exam, written preparation;
- written open-book exercises exam.

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.

GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Structural Stability (E044311)

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 seminar
B (semester 1)	Dutch	Gent	

Lecturers in academic year 2023-2024

Caspeele, Robby	TW14	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Bridging Programme Master of Science in Civil Engineering	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Civil Engineering	6	B
Master of Science in Civil Engineering	6	A

Teaching languages

Dutch, English

Keywords

Critical load, post critical behaviour, buckling modes, flexural buckling, plate buckling, lateral torsional buckling, overturning of lifted beams, compression members

Position of the course

In the course "Metal Constructions" is was explained how to design parts in steel structures (like plate girders and connections) so that the strength and stiffness conditions are fulfilled. In this course additional aspects, influencing the design, are treated. Not only the resistance of cross-sections must be verified but also the stability of the members of the supporting structure. Different cases of instability are considered like flexural buckling of compression members, flexural or flexural torsional buckling of members under compression and bending, plate buckling, flexural torsional buckling of beams.

Contents

- Potential energy: Conservative system of forces and elastic energy
- Principle of minimum potential energy: Determination of an equilibrium state, Method of Ritz
- Nature of the equilibrium state: Stable, unstable and indifferent equilibrium: Simple mechanical models, Post critical behaviour of a compression member, Beam on elastic foundation and cylinder, Plates, Failure modes of a frame, Influence of geometrical imperfections
- Second order effects in frames: P-Delta effect, Stability functions, Implications in the method of Gehler

- Compression members: Flexural buckling, Uniform built-up compression members, Members with bending and axial compression
- Lateral torsional buckling of plate girders
- Folding of plate girders and thin-walled box girders
- Classification of frames: Classification of frames

Initial competences

This course builds on certain learning outcomes of the following course units: Structural Analysis I and II and Metal Constructions.

Final competences

1 To understand and to be able to apply the theory of non linear behaviour of structures.
2 To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable).
3 Being able to solve basic instability problems.
4 Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression.
5 Being able to design a twofold compression member.
6 To be able to design and to calculate a frame taking into account geometrically non linear behaviour.
7 To understand the effect of imperfections on the behaviour of structures.

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

Lecture, seminar, independent work

Learning materials and price

syllabus (about 20 euro)

References

- D. Vandepitte, Berekening van Constructies, (Deel I -1979, II-1980 en III-1981) , Story-Scientia Gent.
- www.berekeningvanconstructies.be

Course content-related study coaching

The lecturer and assistants can be contacted before or after the lectures or exercise sessions, through e-mail or after making an appointment.

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment, written assessment open-book

Examination methods in case of periodic evaluation during the second examination period

Oral assessment, written assessment open-book

Examination methods in case of permanent evaluation

Oral assessment, written assessment open-book

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

During examination period: oral closed-book examination (theory); written open-book examination (exercises). During semester: 1 or more evaluation sessions with written exercises to be solved open-book or the oral presentation of the analysis of a scientific journal article.

Calculation of the examination mark

Special conditions: the end-of-term exam on theory has a weighting factor of 1/3 and the end-of-term exam on the exercises has a weighting factor of 4/9; the permanent assessment has a weigthing factor of 2/9.

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Course Specifications

Valid as from the academic year 2023-2024

Mechanical Vibrations (E040670)

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 2)	Dutch	Gent	
B (semester 2)	English	Gent	lecture seminar

Lecturers in academic year 2023-2024

Loccufier, Mia	TW08	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B

Teaching languages

Dutch, English

Keywords

vibrations analysis, structural and machine dynamics

Position of the course

This course studies the dynamic response of mechanical structures to dynamic loads. The course emphasizes the important fundamental concepts to perform the dynamical analysis of elastic structures such that an optimal design can be obtained, passive control devices can be designed and industrial experiments and software packages can be understood.

Contents

- Introduction: Dynamic behaviour of mechanical structures and machines
- Modelling: Lagrange's equations
- Linear models
- Systems with one degree of freedom: Free vibration-energy method, Forced vibration, Harmonic vibrations, Random vibrations,
- Dynamic loads: unbalance, vortex shedding, mulit-cylinder machines
- Modal analysis: Vibration modes of undamped, proportional damped and non-proportional damped systems, Earthquake response
- Harmonic vibrations
- Passive vibration control: vibration isolation, Vibration absorbers
- Experimental modal analysis: SDOF methods, MDOF methods
- Rayleigh-Ritz theory: Rayleigh's quotient-Rayleigh-Ritz method, Model reduction
- Selfinduced vibrations
- Continuous systems: axial vibration, torsional vibration, transverse vibration
- Introduction of rotordynamics

Initial competences

Classic mechanics and mechanics of materials.

Final competences

1 Modelling of rotating and non-rotating mechanical systems based on Langrange's technique.
2 Calculate vibration levels of mechanical structures subjected to dynamic loads.
3 Perform a modal analysis and formulate structural modifications for continuous and discrete systems.
4 Design of vibration isolation and vibration absorption devices.
5 Identify modal parameters from an experiment
6 Apply model structure preserving reduction techniques.

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

Lecture, seminar, independent work, practical

Learning materials and price

Course is distributed via the electronic learning platform (free of charge)

References

- Mechanical Vibrations, S. Rao, Prentice-Hall, 2005.
- Rotating Machinery Vibration: From Analysis to Troobleshooting, M.L. Adams, Marcel Dekker Inc., 2000.
- Harris' Shock and Vibration Handbook, C. M. Harris and A. G. Piersol, McGraw-Hill, 2002.
- Modal testing, theory and practice, D.J. Ewins, John Wiley and Sons, New York, 2000.
- Mechanical Vibrations, J.P. Den Hartog, Dover publications, Inc. New York, 1984.

Course content-related study coaching

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral assessment, written assessment

Examination methods in case of periodic evaluation during the second examination period

Oral assessment, written assessment

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Permanent evaluation
The permanent evaluation concerns the execution of measurements and the answering of corresponding questions. The results are handed in as a report.
During examination period:
The oral exam part is a questioning based on a written preparation.
The written exam part is an open-book exam on problems.

Calculation of the examination mark

permanent evaluation: 4 of 20
oral exam part: 8 of 20
written exam part: 8 of 20
The result of the permanent evaluation can be transferred to the second examination period.