

# International Master Programme in **SUSTAINABLE MARITIME ENGINEERING**



*A brief guide for course organisation*

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## 1. Course catalogue for the master programme Sustainable Maritime Engineering

<b>Mandatory courses (54 CP)</b>	<b>CP</b>
Design of Offshore Systems	6
Principle Analysis of Marine Structures	6
Principles of Marine Fluid Mechanics	6
Safety of Maritime Systems	6
Ship Design	6
Team Project	6
Master Thesis	30
<b>Elective courses – SME (min. 36 CP to be selected)</b>	<b>CP</b>
Advanced Analysis of Marine Structures	6
Advanced Analysis of Offshore Systems	6
CFD in Maritime Engineering	6
Coding of Finite Elements	6
Composite Materials Design	6
Continuum Mechanics	6
Deep-Sea Technology and Practical Applications of Underwater Technology	6
Design of Offshore Aquaculture Systems	6
Design of Underwater Systems	6
Experimental Methods in Maritime Engineering	6
Large Engines, Energy Converters and Fuels for Climate Neutral Marine Applications	6
Modelling and Simulation of Turbulent Flows	6
Navigation, Control and Vehicle Autonomy of Maritime Systems	6
Ocean Renewable Energies	6
Ocean Research Technologies	6
Ocean Waves	6
Resistance and Propulsion	6
Sailing Theory	6
Seakeeping and Manoeuvring	6
Selected Topics for the Analysis of Marine Structures	6
Ship Life Cycle Digitalization	6
Structural Design of Marine Structures	6
Technical Production Processes of Maritime Structures and Ships	6
Ultimate Strength Assessment of Marine Structures	6
<b>Elective courses – technical (min. 12 CP to be selected)</b>	<b>CP</b>
Dynamics of Multibody Systems	6
Finite Element Analysis of Composite Structures	6
Introduction to C++	6
Maritime Graphics	6
Metallic Engineering Materials	6
Numerical and Experimental Hydroacoustics	6
Numerical Fluid Mechanics and Turbulent Flows	6
Principles of Energy Technology Systems & Applications in the Maritime Context	6
Robust Control and State Estimation	6
Structural Durability	6
Technical Fluids for Sustainable Maritime Applications	6
<b>Elective courses – non-technical (min. 6 CP to be selected)</b>	<b>CP</b>
Essentials of Ocean Science and Sustainable Ocean Use	6
Foundations of Machine Learning	6
German A1.1 CEFR	6
German A1.2 CEFR	6
Professional English for Engineering C1.1 CEFR	6
Professional English for Engineering C1.2 CEFR	6
Reasoning under Uncertainty	6

## 2. Recommended elective course selection for specialisation paths

Important notice: The following course selection scenarios are recommendations based on the experience of the teaching staff of the programme. Apart from the mandatory courses, students are generally free to combine elective courses within the following minimum requirements per category:

- at least 36 CP have to be taken in SME electives
- at least 12 CP have to be taken in technical electives
- at least 6 CP have to be taken in non-technical electives

### 2.1 Naval Architecture

With a specialisation in Naval Architecture, graduates are ideally equipped for all activities related to ship technology and in particular the challenges surrounding the topic of green shipping. Potential employers include shipyards, shipowners, engineering offices, suppliers, service providers, research and testing facilities (such as towing tanks) and classification societies.

In addition to two central compulsory elective modules of overarching importance (*Resistance and Propulsion* and *Ship Life Cycle Digitalization*), three courses for further specialisation in the subject areas of Structural Mechanics, Hydromechanics and Advanced Technologies are recommended as listed in Table 1.

Example: When a student wants to specialise in the hydromechanics aspects of naval architecture, we recommend to select the following elective modules (30 CP in total):

- Resistance and Propulsion (6 CP)
- Ship Life Cycle Digitalization (6 CP)
- Seakeeping and Manoeuvring (6 CP)
- CFD in Maritime Engineering (6 CP)
- Experimental Methods in Maritime Engineering (6 CP)

Table 1: Overview for the path Naval Architecture. Recommendations for elective modules

Naval Architecture		
Resistance and Propulsion		
Ship Life Cycle Digitalization		
Structural Mechanics	Hydromechanics	Advanced Technologies
Structural Design of Marine Structures	Seakeeping and Manoeuvring	Composite Materials Design
Advanced Analysis of Marine Structures	CFD in Maritime Engineering	Large Engines, Energy Converters and Fuels for Climate-Neutral Marine Applications
Selected Topics for the Analysis of Marine Structures	Experimental Methods in Maritime Engineering	Technical Production Processes of Maritime Structures and Ships

Including the 54 CP for the mandatory courses, 84 CP are taken when a student takes this path, leaving room to select additional courses for 36 CP. Of these, at least 6 additional CP have to be selected from SME electives, at least 12 CP from technical electives and at least 6 CP from non-technical electives.

## 2.2 Ocean Engineering

With a specialisation in Ocean Engineering, graduates are sought-after specialists in the field of offshore infrastructures, in particular for the utilisation of renewable energies from the sea. There are excellent prospects of getting a job at shipyards, engineering offices, energy companies, suppliers, research and testing facilities and classification societies.

In addition to two central compulsory elective modules of overarching importance (*Advanced Analysis of Offshore Systems* and *Ocean Waves*), three courses for further specialisation in the subject areas of Structural Mechanics, Hydromechanics and Advanced Technologies are recommended as listed in Table 2.

Example: When a student wants to specialise in the structure mechanical aspects of ocean engineering architecture, we recommend to select the following elective modules (30 CP in total):

- Advanced Analysis of Offshore Systems (6 CP)
- Ocean Waves (6 CP)
- Structural Design of Marine Structures (6 CP)
- Advanced Analysis of Marine Structures (6 CP)
- Selected Topics for the Analysis of Marine Structures (6 CP)

Table 2: Overview for the path Ocean Engineering. Recommendations for elective modules

Ocean Engineering		
Advanced Analysis of Offshore Systems		
Ocean Waves		
Structural Mechanics	Hydromechanics	Advanced Technologies
Structural Design of Marine Structures	Design of Offshore and Aquaculture Systems	Ocean Renewable Energies
Advanced Analysis of Marine Structures	CFD in Maritime Engineering	Navigation, Control and Vehicle Autonomy of Maritime Systems
Selected Topics for the Analysis of Marine Structures	Experimental Methods in Maritime Engineering	Ocean Research Technologies

Including the 54 CP for the mandatory courses, 84 CP are taken when a student takes this path, leaving room to select additional courses for 36 CP. Of these, at least 6 additional CP have to be selected from SME electives, at least 12 CP from technical electives and at least 6 CP from non-technical electives.

### 2.3 Underwater Technologies

With a specialisation in Underwater Technologies, graduates are excellently prepared for exciting tasks in the field of marine research technologies and underwater vehicles. Potential employers include research institutions, engineering offices, suppliers and service providers.

In addition to two central compulsory elective modules of overarching importance (*Design of Underwater Systems* and *Navigation, Control and Vehicle Autonomy of Maritime Systems*), three courses for further specialisation in the subject areas of Design and Operations are recommended as listed in Table 3.

Example: When a student wants to specialise in the operations of underwater technologies, we recommend to select the following elective modules (30 CP in total):

- Design of Underwater Systems (6 CP)
- Navigation, Control and Vehicle Autonomy of Maritime Systems (6 CP)
- Deep-Sea Technology and Practical Applications of UW Technology (6 CP)
- CFD in Maritime Engineering (6 CP)
- Ocean Research Technologies (6 CP)

Table 3: Overview for the path Underwater Technologies. Recommendations for elective modules

Underwater Technologies	
Design of Underwater Systems	
Navigation, Control and Vehicle Autonomy of Maritime Systems	
Design	Operations
Advanced Analysis of Marine Structures	Deep-Sea Technology and Practical Applications of UW Technology
Deep-Sea Technology and Practical Applications of UW Technology	CFD in Maritime Engineering
Composite Materials Design	Ocean Research Technologies

Including the 54 CP for the mandatory courses, 84 CP are taken when a student takes this path, leaving room to select additional courses for 36 CP. Of these, at least 6 additional CP have to be selected from SME electives, at least 12 CP from technical electives and at least 6 CP from non-technical electives.