Programme syllabus

Master's Programme, Maritime Engineering, 120 credits
Masterprogram, marinteknik
120.0 credits

Valid for students admitted to the education from autumn 14 (HT - Autumn term; VT - Spring term).

This is a translation of the Swedish, legally binding, programme syllabus.

Programme objectives

The Nordic Master Programme in Maritime Engineering is given in collaboration between the Nordic Five Tech Universities – KTH (Sweden), Chalmers (Sweden), DTU (Denmark), Aalto (Finland), and NTNU (Norway)– and hereby combines these five universities’ lead expertise and long tradition in maritime engineering. Students begin their studies in this programme at one of the partner universities for year one, and complete their studies at another university for year two, resulting in a double degree from the two universities. As an engineer graduated from this programme you will possess a deep theoretical knowledge of topics such as waves and wave loads; the interaction between water and structures; stability and dynamics of ships, small craft and platforms; propulsion; and advanced steel and lightweight structures. You will also have a high level of knowledge and experience of the design, construction and operation of ships, small craft and offshore structures, including technical as well as economic, social, and environmental aspects. The multi-disciplinary character of the subject maritime engineering, and the structure and curriculum of this program, make the education relevant for careers in the maritime sector as well as in other fields.

Knowledge and understanding

A Master of Science in Maritime Engineering will:

- have the knowledge and understanding of the topic enough to be employable as a Naval Architect and in other fields of engineering in Sweden and internationally,
- possess a systems perspective on engineering,
- have confidence in hers/his base of engineering fundamentals,
- be aware of the general professional conditions in the industry,
- be familiar with the needs and conditions for sustainable development.

Skills and abilities

A Master of Science in Maritime Engineering will:
• have the ability to independently and creatively formulate and critically and systematically handle and analyze complex problems and situations, using relevant modern methods and tools,
• have the ability to Conceive, Design, Implement and Operate boats, ships and complex value-added naval systems in modern team-based environments,
• have the ability to, both orally and in writing, communicate and discuss conclusions and the underlying theory and argumentation,
• have good individual and group interactions abilities, such as, teamwork, leadership, and communication skills,
• be able to follow and participate in research and development work in the field of naval architecture.

Ability to make judgements and adopt a standpoint

A Master of Science in Maritime Engineering will:

• have the ability to in the field of naval architecture make decisions regarding research and development work based on relevant scientific, societal and ethical aspects,
• show insight regarding the possibilities and limitations of engineering science and its role in the society,
• have ability to identify the need for further knowledge in the field and take responsibility for keeping their personal knowledge up to date.

Complete information on the degree requirements can be found at the local degree policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/1.27227

Extent and content of the programme

The Nordic master program in Maritime Engineering is a two-year (120 university credits) master program on the advanced level (second cycle) starting every year in late August. The instruction language is English. The programme is structured in two parts:

1. In the first year, focus is on general maritime engineering topics and naval architecture on Master level: stability, resistance and propulsion, seakeeping, manoeuvring and ship and ocean structures.

2. In the second year, students specialize in one of the five study tracks: Ocean Structures (NTNU), Passenger Ships (Aalto), Ship Design (Chalmers), Ship Operations (DTU), Small Craft (KTH). Some more information on the tracks is given in Appendix A.

It is thus required that the student starts at one of the partner universities for year 1 and finish the studies at another university for year 2. A student starting at KTH may not take the KTH study track during year 2.

Eligibility and selection

Basic eligibility requirements

The basic admission requirements are the same for all master programmes:

Specific eligibility requirements

A BSc in Naval Architecture is required. The following alternative degrees might however be considered on an individual basis:

- BSc in Ocean Engineering, Vehicle Engineering, Mechanical Engineering, Civil Engineering or Engineering Physics.
- BEng in Naval Architecture, Ocean Engineering or Mechanical Engineering.

The applicant’s qualifications must include a strong working knowledge of mathematics and mechanics fulfilling the following minimum requirements:

- Mathematics: 25 ECTS including linear algebra, calculus and differential equations.
- Statistics and probability theory: 5 ECTS.
- Statics, mechanical vibrations, and strength of materials: 10-15 ECTS
- Fluid mechanics: min. 5 ECTS

Moreover, the applicant must have sufficient qualifications within numerical methods and elementary programming using e.g. MATLAB or a similar programming language.

Selection process

For applicants fulfilling the above requirements the ranking is done based on the following criteria: University, Grade Point Average (GPA), and motivation letter. All applications are academically evaluated by the consortium partner universities. Admission is based on joint decision by the admission board of the consortium. There is a maximum in the number of students admitted to each university and to each study track. The maxima are decided by the admission board.

Implementation of the education

Structure of the education

The academic year at KTH is divided into four periods. Each period lasts approximately seven weeks with at least 33 days of study. Each period is followed by an exam period. In addition to the four regular exam periods, there are three additional re-examination periods: after Christmas, after May and immediately proceeding the first study period of the academic year. The academic year has a duration of 40 weeks. Teaching activities may, if necessary, be scheduled outside the academic year. The first three quarters of the program (90 university credits) is course based, while the last half year (30 university credits) is devoted to the degree project.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The compulsory courses during the first year at KTH are:

SD2411 Lightweight structures and FEM, 8 ECTS
SD2706 Sailing for performance, 6 ECTS
SD2710 Initial ship design, 8 ECTS
SD2707 Marine innovation, 5 ECTS
SD2708 Hull structural design, 6 ECTS
SD2711 Small craft design (spring semester), 10 ECTS
SD2703 Marine dynamics, 8 ECTS
SG2212 Fluid mechanics, CFD, 7.5 ECTS

The elective courses during the first year are:
SD2415 Composites, process modelling, 6 ECTS
SE1025 FEM, 4 ECTS
SG2214 Fluid mechanics, 7.5 ECTS
ME1003 Industrial management, 6 ECTS

Compulsary courses in the small craft track at KTH during year 2 are:
SD3705 High Speed Craft, 6 ECTS
SD2416 Structural Optimization & Sandwich, 6 ECTS
SD2706 Sailing for Performance, 6 ECTS
SD2707 Marin innovation, 5 ECTS

Information about the courses at the other universities can be found in the consortium web site:
http://www.nor-mar-eng.org/

**Grading system**

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

**Conditions for participation in the programme**

No later than November 15 and May 15 each academic year, respectively, the students are required to make a study registration and course selection for the coming term. At least 45 university credits have to
be completed during the first academic year (including the re-examination period in August) in order for the student to be promoted to the second year of the program. New students have to make a decision about their *Track* in the very beginning of the program.

**Recognition of previous academic studies**

Under certain circumstances, and in agreement with the program director, credits for previous studies can be received according to the local policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/prestationer/1.27200

**Degree project**

Students admitted to the program are required to perform an independent study in the form of a thesis project corresponding to 30 university credits. Local rules for the degree project may apply depending on choice of university for year 2. Students in second year at KTH must have completed at least 60 university credits of the total course to start the project. The purpose of the thesis project is that the student should demonstrate the ability to perform independent project. More information on the KTH policy on the degree project can be found at http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete/1.27212

**Degree**

Students who fulfill all the requirements will be awarded a Degree of Master of Science (two years). Students must apply for the degree and also show proof of their basic degree (Bachelor's or similar). Complete information on the degree requirements can be found in the local degree policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina/1.27227

The application form for the degree is found at the personal menu at www.kth.se.

Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
Appendix 1: Course list

Master's Programme, Maritime Engineering, 120 credits (TMEGM), Programme syllabus for studies starting in autumn 2014

General courses

Year 1

Mandatory courses (51.0 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2411</td>
<td>Lightweight Structures and FEM</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2703</td>
<td>Marine Dynamics</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2706</td>
<td>Sailing for Performance</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2707</td>
<td>Marine Innovation</td>
<td>5.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2708</td>
<td>Hull Structural Design</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2710</td>
<td>Initial Ship Design</td>
<td>8.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2711</td>
<td>Small Craft Design</td>
<td>10.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

Optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME1003</td>
<td>Industrial Management, Basic Course</td>
<td>6.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SD1105</td>
<td>Matlab</td>
<td>3.0 hp</td>
<td>First cycle</td>
</tr>
<tr>
<td>SD2125</td>
<td>Signals and Mechanical Systems</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2413</td>
<td>Fibre Composites - Analysis and Design</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2415</td>
<td>Process Modelling for Composite Manufacturing</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2416</td>
<td>Structural Optimisation and Sandwich Design</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SG2212</td>
<td>Computational Fluid Dynamics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SG2214</td>
<td>Fluid Mechanics</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SG2224</td>
<td>Applied Computational Fluid Dynamics</td>
<td>5.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
Track, Ocean Structures (MEGA)

Track, Passenger Ships (MEGB)

Track, Ship Design (MEGC)

Track, Ship Operations (MEGD)

Track, Small Craft (MEGE)

Year 2

Mandatory courses (26.5 Credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2705</td>
<td>High-Speed Craft</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2709</td>
<td>Underwater Technology</td>
<td>7.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2711</td>
<td>Small Craft Design</td>
<td>10.0 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2724</td>
<td>Minor Marine Technology Project</td>
<td>3.0 hp</td>
<td>Second cycle</td>
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</tbody>
</table>

Optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK2030</td>
<td>Theory and Methodology of Science (Natural and Technological Science)</td>
<td>4.5 hp</td>
<td>Second cycle</td>
</tr>
<tr>
<td>SD2416</td>
<td>Structural Optimisation and Sandwich Design</td>
<td>6.0 hp</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>
Appendix 2: Specialisations

Master's Programme, Maritime Engineering, 120 credits (TMEGM), Programme syllabus for studies starting in autumn 2014

Track, Ocean Structures (MEGA)

This study track, given at NTNU, gives you a strong foundation for design of any type of ocean structure, from conventional ships to offshore structures. It also deals with marine operations like pipelaying, towing and use of cranes on mobile platforms for installation of subsea modules. The study track is discipline based and includes groups of courses within marine environment, environmental loads, effects of loads, structural capacity and marine cybernetics.

Track, Passenger Ships (MEGB)

This study track, given at Aalto, gives comprehensive overview of the different aspects related to the design, analysis and optimization of passenger ships. The conflicting interests of various stakeholders (passenger, ship owner, shipyard) will be addressed during the studies, and you will be forced to create a solution that satisfies the stakeholder's preferences.

Track, Ship Design (MEGC)

In this study track, you will be part of a project team and work with a problem oriented and realistic ship-design project with a company from the maritime industry as the “customer”. You will be part of a student team guided by professional engineers from industry and faculty members from Chalmers. The initial design process prior to an order of a new ship is covered during the project following the demands of the customer. The project will take place during the second year and you will utilize and link together knowledge from all the marine engineering courses of the first year.

Track, Ship Operations (MEGD)

In popular terms the definition of this study track is that it mainly deals with naval architecture and maritime engineering from the point of view of the ship owner, i.e. it deals with ships at sea. You will learn to apply rational methods in analysing and optimizing the performance of ships (container ships, tankers, bulk carriers, ro-ro ships etc.) with respect to safety, efficiency, economics and environmental considerations. The track is given at DTU.

Track, Small Craft (MEGE)
This track will prepare you for the engineering challenges involved in the design of small craft, such as fast rescue boats, patrol boats, high-speed race boats, and sailing boats, with requirements on high performance in tough operational conditions. You will learn about composite materials and structure design, high-speed hydromechanics, sailing mechanics, and application of rational methods for systems engineering and innovative design in projects in collaboration with industrial designers.