



Programme syllabus

Master's Programme, Naval Architecture, 120 credits

Masterprogram, marina system

120.0 credits

Valid for students admitted to the education from autumn 16 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The overall objective with the Master of Science Program in Naval Architecture is to educate skillful, creative, independent and conscious engineers, who through their knowledge and skills, working methods and approach, can contribute to a sustainable development of the society. Naval Architecture is a multidisciplinary subject with a strong emphasis on systems engineering and engineering design. As an engineer graduated with a Master of Science in Naval Architecture from KTH you will possess knowledge and experience of the complete processes of conception, design, modeling, implementation and operation of boats, ships, marine installations and other complex systems, along with deep theoretical knowledge in related topics such as lightweight structures, fluid mechanics and management. The program is characterized by a progressive learning environment with the student in focus and has a reputation of educating creative and skillful engineers that are attractive in the maritime sector as well as in other branches of engineering both in Sweden and internationally.

Knowledge and understanding

To qualify for the degree of Master of Science in Naval Architecture the student shall be able to:

1. demonstrate broad knowledge and understanding of the scientific basis and proven experience of naval architecture and deeper insight into current research and development work;
2. give an account of the international shipping markets and the corresponding stakeholders, goods flow paths, and ship types;
3. demonstrate broad general knowledge and understanding in mathematics and mechanics, as well as substantially deeper methodological knowledge and understanding in naval architecture and the chosen area of specialization (lightweight structures, fluid mechanics or management)

Skills and abilities

4. demonstrate ability to, from a holistic perspective, critically, independently and creatively identify, formulate and deal with complex issues and situations in naval architecture, mechanical engineering and engineering design;
5. demonstrate ability to create, analyze and critically evaluate different technical solutions for ships and other complex technical systems;
6. demonstrate ability to plan and carry out advanced engineering tasks within given frames using appropriate methods and to evaluate this work;
7. demonstrate the skills required to participate in research and development work or to work independently in other advanced contexts so as to contribute to the development of knowledge;
8. demonstrate ability to critically and systematically integrate knowledge;
9. demonstrate ability to model, simulate, predict and evaluate the technical characteristics of ships, their components, and related phenomena, even on the basis of limited information;
10. demonstrate ability to design ships and other technical systems and related processes taking into account people's situations and needs, and the society's objectives for economically, socially and ecologically sustainable development;
11. demonstrate ability to engage and contribute in teamwork and cooperation in groups of varying composition;
12. demonstrate ability to clearly present and discuss engineering conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts;

Ability to make judgements and adopt a standpoint

13. demonstrate ability to make sound judgements in the design and assessment of ships and other technical systems, taking into account relevant scientific, social, ethical, economic and environmental aspects;
14. demonstrate awareness of and insight in the potential and limitations of technology and science, its role in society and people's responsibility for how it is used;
15. demonstrate ability to identify their need for further knowledge and to take responsibility for continuously upgrading personal knowledge and capabilities.

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

Naval Architecture at KTH 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

consists of a core and three optional tracks. In the core you develop your general knowledge and skills in systems engineering and ship design and a theoretical foundation in ship hydrostatics and stability, resistance and propulsion, wave modeling, seakeeping, maneuvering, and ship structures. By choosing one of the tracks you have the opportunity to develop deeper understanding and skills in lightweight structures, fluid mechanics and management. There is also a set of elective courses where you have the opportunity to broaden your education or specialize in high-speed craft, underwater technology or in other areas suitable for your interests and career goals. Some more details about the core and the tracks are given in Appendix 1.

Eligibility and selection

Basic eligibility requirements

A completed Bachelor's degree, corresponding to a Swedish Bachelor's degree (180 ECTS), or equivalent academic qualifications from an internationally recognised university.

English language proficiency equivalent to (the Swedish upper secondary school) English course B /6. There are different ways to fulfill the English language requirements, see: www.kth.se

Specific eligibility requirements

A BSc in Naval Architecture, Vehicle Engineering, Mechanical Engineering, Engineering Physics or similar is required. A BEng in similar areas might be considered on an individual basis. 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, differential equations and numerical methods.
- Structure mechanics and materials: 12 ECTS

Moreover, the applicant must have sufficient qualifications within elementary programming using e.g. MATLAB or a similar programming language. The specific requirements may be assessed as not fulfilled if the grade point average is below 75 % of the scale maximum.

Selection process

The selection process is based on the following selection criteria: University, previous studies (for instance GPA), motivation for the studies (for instance letter of motivation, references).

The evaluation scale is 1-75.

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](#).

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.

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Conditions for participation in the programme

Course application

All programme students apply for courses 1-15 November/1-15 May for the next semester. The application is done via universityadmissions.se

Semester registration

Everyone admitted to an educational programme at KTH must register for the semesters they intend to study. Semester registration is a prerequisite and is required for the registration and reporting of results on courses. You can carry out a web registration at the same time as the semester starts, provided that you have fulfilled requirements for the coming semester.

Semesterregistration is done by the “personal menu” at www.kth.se

Recognition of previous academic studies

Under certain circumstances, and in agreement with the programme director, credits for previous studies can be received according to the local policy of KTH.

Studies abroad

After approval by the programme director, part of the studies may be carried out abroad (including the Master’s degree project). The condition is that the parts of the programme carried out abroad should fit in with the educational programme.

Degree project

A 30-credit Master’s degree project is carried out at the end of the educational programme (usually the fourth semester). The purpose of the project is to let the student study a problem in more depth than is possible in the courses. The project may be carried out in an academic or industrial environment in

Sweden or abroad. To be allowed to start a degree project, a student must have accumulated at least 60 credits.

The choice of project must be approved by the programme director.

The Degree project is graded with P/F.

Degree

In order to earn a Degree of Master of Science, passing grades in all courses which are included in the student's study plan are required. The study plan must comprise 120 higher education credits which include a degree project consisting of 30 higher education credits, in the second cycle.

KTH's local degree ordinance can be found at KTH's website, www.kth.se.

Application for degree certificate

When the studies at KTH are completed a degree certificate can be applied for.

Application is done by the "personal menu" at www.kth.se

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Naval Architecture, 120 credits (TMRSM),
Programme syllabus for studies starting in autumn 2016

General courses

Year 1

Mandatory courses (24.0 Credits)

Course code	Course name	Credits	Edu. level
SD2721	Ship Design	9.0 hp	Second cycle
SD2722	Marine Structures	7.5 hp	Second cycle
SD2723	Marine Hydromechanics	7.5 hp	Second cycle

Optional courses

Course code	Course name	Credits	Edu. level
ME1003	Industrial Management, Basic Course	6.0 hp	First cycle
ME2818	Design Thinking	7.5 hp	Second cycle
MF2047	Internal Combustion Engines 1	6.0 hp	Second cycle
MG1010	Introductory Welding Technology, General Course	6.0 hp	First cycle
SD2414	Fibre Composites - Materials and Manufacturing	6.0 hp	Second cycle
SD2702	Naval Design 10 cr are studied during the second term and 10 cr during the third term.	20.0 hp	Second cycle
SD2705	High-Speed Craft	6.0 hp	Second cycle
SD2709	Underwater Technology	7.5 hp	Second cycle
SG2218	Turbulence	7.5 hp	Second cycle

Supplementary information

Compulsory courses + tracks-courses 75 cr.

Students who are planning to study abroad the second year has to take AK2030 the first year. All other students should take this course in the autumn semester the second year.

Also the course MO1002 Oceanography, Introductory course, 7,5 cr, given by Stockholm University can be taken as elective by Swedish citizens.

Year 2

Optional courses

Course code	Course name	Credits	Edu. level
ME1003	Industrial Management, Basic Course	6.0 hp	First cycle
MF2047	Internal Combustion Engines 1	6.0 hp	Second cycle
SG2218	Turbulence	7.5 hp	Second cycle

Supplementary information

Compulsory courses + tracks-courses 75 cr.

Students who are planning to study abroad the second year has to take AK2030 the first year. All other students should take this course in the autumn semester the second year.

Also the course MO1002 Oceanography, Introductory course, 7,5 cr, given by Stockholm University can be taken as elective by Swedish citizens.

Track, Lightweight Structures (MRSA)

Year 1

Mandatory courses (20.0 Credits)

Course code	Course name	Credits	Edu. level
SD2411	Lightweight Structures and FEM	8.0 hp	Second cycle
SD2413	Fibre Composites - Analysis and Design	6.0 hp	Second cycle
SD2416	Structural Optimisation and Sandwich Design	6.0 hp	Second cycle

Year 2

Mandatory courses (13.5 Credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle

[SD2416](#) [Structural Optimisation and Sandwich Design](#)

6.0 hp Second cycle

Conditionally elective courses

Course code **Course name**

Credits Edu. level

[SD2705](#) [High-Speed Craft](#)

6.0 hp Second cycle

[SD2709](#) [Underwater Technology](#)

7.5 hp Second cycle

Track, Fluid Mechanics (MRSB)

Year 1

Mandatory courses (20.0 Credits)

Course code **Course name**

Credits Edu. level

[SG2212](#) [Computational Fluid Dynamics](#)

7.5 hp Second cycle

[SG2214](#) [Fluid Mechanics](#)

7.5 hp Second cycle

[SG2224](#) [Applied Computational Fluid Dynamics](#)

5.0 hp Second cycle

Year 2

Mandatory courses (7.5 Credits)

Course code **Course name**

Credits Edu. level

[AK2036](#) [Theory and Methodology of Science with Applications \(Natural and Technological Science\)](#)

7.5 hp Second cycle

Conditionally elective courses

Course code **Course name**

Credits Edu. level

[SD2705](#) [High-Speed Craft](#)

6.0 hp Second cycle

[SD2709](#) [Underwater Technology](#)

7.5 hp Second cycle

Track, Management (MRSD)

Year 1

Mandatory courses (22.5 Credits)

Course

code	Course name	Credits	Edu. level
AL2160	Environmental Management	7.5 hp	Second cycle
AL2181	Environmental System Analysis and Decision-making	7.5 hp	Second cycle
EH2720	Management of Projects	7.5 hp	Second cycle

Year 2

Mandatory courses (15.0 Credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle
AL2181	Environmental System Analysis and Decision-making	7.5 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
SD2705	High-Speed Craft	6.0 hp	Second cycle
SD2709	Underwater Technology	7.5 hp	Second cycle



Appendix 2: Specialisations

Master's Programme, Naval Architecture, 120 credits (TMRSM),
Programme syllabus for studies starting in autumn 2016

Track, Lightweight Structures (MRSA)

Marine vessels are in general lightweight structures built as stiffened shells in hierarchical arrangement. The dominating material in shipbuilding is still conventional steel but it is likely that the use of composite materials will increase, for example to decrease weight and thereby increase the ships energy efficiency and environmental performance. Internationally leading research is conducted at KTH Lightweight Structures which has supported the Swedish industry to apply fibre reinforced composite and sandwich material concepts in large vessels. A significant example is the 70 metre all carbon fibre Visby class corvette. Students studying naval architecture at KTH have the opportunity to combine fundamental principles of naval architecture with knowledge about modern materials and related design principles and manufacturing methods.

Contact person for the Lightweight Structures track is Dan Zenkert, danz@kth.se, 08-7906435.

Track, Fluid Mechanics (MRSB)

This track will deepen your understanding of and develop your working skills in incompressible fluid mechanics which is the basis for the flow around ships and other technical systems. In the courses, the governing set of partial differential equations, the Navier-Stokes equations, are derived, dissected, simplified and solved and the characteristics of boundary layers are investigated. The profile also includes modules concerning modern computational tools (CFD) for solving for the flow patterns in more complex situations. The fundamental mathematical principles of CFD is covered as well as hands-on projects where modelling and solving of real problems are done.

Contact person for the profile Fluid Mechanics track is Luca Brandt, luca@mech.kth.se, 08-7906870.

Track, Management (MRSD)

This track will develop your knowledge of the financial, organizational and managerial aspects in the maritime field, and developing your understanding of the concepts of sustainable development from environmental, social and economic viewpoints. Emphasis is on the ability to manage and control projects, the connection between business strategy and management, strategies for sustainable development, the role of technology, and management tools and systems analysis methods. It gives a good foundation for employment as a manager for companies and projects within the maritime industry as well as a general knowledge about these roles in other types of industries.

Contact person for the Management track is Monika Olsson, monika@kth.se, 08-7906150.