



Programme syllabus

Master's Programme, Naval Architecture, 120 credits

Masterprogram, marina system

120.0 credits

Valid for students admitted to the education from autumn 15 (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

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

<http://www.kth.se/en/studies/master/kth/admission/admission-requirements-and-selection-1.6915>

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 BSc (or BEng) Cumulative Grade Point Average (CGPA) must be at least 75 % of the scale maximum.

Selection process

For applicants fulfilling the above requirements the ranking is done based on a total evaluation of the following criteria: University, Grade Point Average (GPA) and motivation letter. Courses on other relevant topics such as probability and statistics and fluid mechanics, letters of recommendation, and relevant work experience are considered as additional qualifications. 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 preceding 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 programme is course-based. The core courses are compulsory and correspond to approximately 30 university credits. In each track there is an additional set of three to four compulsory courses corresponding to approximately 20 university credits. This leaves approximately 40 university credits for elective courses. The compulsory courses and a set of elective 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.

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. To begin the thesis project, a student must have completed at least 60 university credits of the total course work including at least two of the three compulsory courses in the chosen profile. The purpose of the thesis project is that the student should demonstrate the ability to perform independent project work, using and developing the knowledge and skills obtained from the courses in the program. The thesis project can either be performed at a university or, more commonly, at a company in the naval architecture sector or in the sector of the chosen profile with suitable infrastructure to provide sufficient supervision and resources for the project. The student must actively search for a suitable thesis project in industry; KTH will provide some assistance with information on suitable points of contact. Exchange students are recommended to find a thesis project in their country of permanent residence or in the country where they intend to start their professional careers. 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

Programme syllabus for studies starting in autumn 2015, Master's Programme, Naval Architecture, 120 credits (TMRSM)

General courses

Year 1

Mandatory courses (24.0 Credits)

Code	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

Code	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 <i>10 cr are studied during the second term and 10 cr during the third term.</i>	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

Mandatory courses (7.5 Credits)

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

Optional courses

Code	Name	Credits	Edu. level
ME1003	Industrial Management, Basic Course	6.0 hp	First cycle
MF2047	Internal Combustion Engines 1	6.0 hp	Second cycle
MG1010	Introductory Welding Technology, General Course	6.0 hp	First 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.

Track, Lightweight Structures (MRSA)

Year 1

Mandatory courses (20.0 Credits)

Code	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 (6.0 Credits)

Code	Name	Credits	Edu. level
SD2416	Structural Optimisation and Sandwich Design	6.0 hp	Second cycle

Track, Fluid Mechanics (MRSB)

Year 1

Mandatory courses (20.0 Credits)

Code	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

Track, Management (MRSD)

Year 1

Mandatory courses (22.5 Credits)

Code	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



Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2015, Master's Programme, Naval Architecture, 120 credits (TMRSM)

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.