



Programme syllabus

Master's Programme, Naval Architecture, 120 credits

Masterprogram, marina system

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

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 for the maritime sector as well as for other branches of engineering.

Knowledge and understanding

A Master of Science in Naval Architecture shall demonstrate:

- broad knowledge and understanding in naval architecture, scientific basis and proven experience, including knowledge of mathematics and natural sciences, substantially deeper knowledge in certain parts of the field, and deeper insight into current research and development work.
- deeper methodological knowledge in naval architecture.

Skills and abilities

A Master of Science in Naval Architecture shall demonstrate:

- ability to, from a holistic perspective, critically, independently and creatively identify, formulate and deal with complex issues,
- an ability to create, analyze and critically evaluate different technical solutions.
- ability to plan and, using appropriate methods, carry out advanced tasks within specified parameters and to evaluate this work.

- 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.
- ability to critically and systematically integrate knowledge,
- ability to analyze, assess and deal with complex phenomena, issues and situations, and to model, simulate, predict and evaluate events even on the basis of limited information.
- ability to develop, design and operate products, processes and systems taking into account people's situations and needs and society's objectives for economically, socially and ecologically sustainable development.
- ability to engage and contribute in teamwork and cooperation in groups of varying composition.
- ability to clearly present and discuss 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

A Master of Science in Naval Architecture shall demonstrate:

- ability to make assessments in the main field of study, taking into account relevant scientific, social and ethical aspects,
- awareness of ethical aspects of research and development work
- insight into the potential and limitations of technology and science, its role in society and people's responsibility for how it is used, including social and economic aspects, as well as environmental and work environment aspects.
- ability to identify 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 Dynamics, or Management. There is also a set of elective courses where you have the opportunity to broaden your education or specialize in sailing craft and other small craft or in other areas suitable for you 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/programmes/master/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 70% 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), motivation letter, and letter of recommendation. Courses on other relevant topics such as probability and statistics and fluid mechanics as well as relevant work experience are considered as additional qualifications.

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 40 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 30 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; however 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 2014, Master's Programme, Naval Architecture, 120 credits (TMRSM)

General courses

Year 1

Mandatory courses (35.0 Credits)

Code	Name	Credits	Edu. level
SD2411	Lightweight Structures and FEM	8.0 hp	Second cycle
SD2703	Marine Dynamics	8.0 hp	Second cycle
SD2707	Marine Innovation	5.0 hp	Second cycle
SD2708	Hull Structural Design	6.0 hp	Second cycle
	Initial Ship Design		
SD2710	<i>For students who has not done Degree project, first level, in Naval Architecture</i>	8.0 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
AL2161	Environmental Management II, Advanced Course	7.5 hp	Second cycle
AL2191	Technology and Sustainable Development	7.5 hp	Second cycle
ME2016	Project Management: Leadership and Control	6.0 hp	Second 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
SD1105	Matlab	3.0 hp	First cycle
SD2125	Signals and Mechanical Systems	6.0 hp	Second cycle
SD2140	Vibro Acoustics	8.0 hp	Second cycle
SD2155	Flow Acoustics	6.0 hp	Second cycle
SD2415	Process Modelling for Composite Manufacturing	6.0 hp	Second cycle

[SG2211 Vehicle Aerodynamics](#)

6.0 hp Second cycle

[SG2218 Turbulence](#)

7.5 hp Second cycle

Recommended courses

Code Name

Credits Edu. level

[SD2702 Naval Design](#)

10 cr are studied during the second term and 10 cr during the third term.

20.0 hp Second cycle

[SD2706 Sailing for Performance](#)

6.0 hp Second cycle

Supplementary information

Compulsory courses + tracks-courses 75 cr.

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.

Track, Lightweight Structures (MRSA)

Year 1

Mandatory courses (18.0 Credits)

Code Name

Credits Edu. level

[SD2413 Fibre Composites - Analysis and Design](#)

6.0 hp Second cycle

[SD2414 Fibre Composites - Materials and Manufacturing](#) 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 (25.5 Credits)

Code	Name	Credits	Edu. level
AL2160	Environmental Management	7.5 hp	Second cycle
ME1003	Industrial Management, Basic Course *	6.0 hp	First cycle
ME2016	Project Management: Leadership and Control *	6.0 hp	Second cycle
ME2053	Logistics & Supply Chain Management	6.0 hp	Second cycle

Supplementary information

*ME1003 is compulsory but students who have already taken this as part of the bachelor program instead take ME2016.

Year 2

Mandatory courses (7.5 Credits)

Code	Name	Credits	Edu. level
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Appendix 2: Specialisations

Programme syllabus for studies starting in autumn 2014, 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. 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)

Since ships and other naval systems operate in water a good understanding of fluid dynamics is crucial for any naval architect when studying e.g. seakeeping, resistance, propulsion and appendages. This profile is intended to give fundamental understanding as well as working skills in incompressible fluid mechanics which is the basis for the flow around naval systems. In the courses, the governing set of partial differential equations, the Navier-Stokes equations, are derived, dissected, simplified and solved. 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)

As an engineer in the naval architecture field, your work will not only include purely technical activities. Managerial issues will almost always be intertwined with the technical issues and it is important to understand the way businesses are made, the way the industry changes, and the environmental prerequisites. Shipping is, and will continue to be, an important driving force in the development of most parts of the world and will therefore also be a part of the development of new technologies to reach a sustainable global usage of the limited resources of the earth. The Management track in the Naval Architecture Master Program aims at providing knowledge of the financial, organizational and managerial

aspects in the maritime field, and developing your understanding of the concepts of sustainable development from an environmental, social and economic viewpoint. 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. It also prepares for starting and managing a smaller company, such as a consulting firm in the naval architecture field.

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