



# Utbildningsplan

[En tillgänglighetsanpassad version av utbildningsplanen finns i Kurs- och programkatalogen.](#)

## Masterprogram, marina system 120 hp

Master's Programme, Naval Architecture, 120 credits

*Gäller för antagna till utbildningen fr o m HT14.*

### Utbildningens mål

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.

### Kunskap och förståelse

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.

## Färdigheter och förmågor

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.

## Värderingsförmåga och förhållningssätt

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>

# Utbildningens omfattning och innehåll

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 your interests and career goals. Some more details about the core and the tracks are given in Appendix 1.

## Behörighet och urval

### *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.

# Utbildningens genomförande

## Utbildningens upplägg

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.

## Kurser

Utbildningen sker i kursform. Kurslistor finns i bilaga 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.

## Betygssystem

För kurser på KTH används en sjugradig målrelaterad betygsskala A-F som slutbetyg för kurser på grundnivå och avancerad nivå. A-E är godkända betyg med A som högsta betyg. Betygen godkänd (P) och underkänd (F) används som slutbetyg då särskilda skäl föreligger.

Courses in 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.

## Villkor för deltagande i utbildningen

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.

## Tillgodoräknanden

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>

## Examensarbete

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>

## Examen

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](http://www.kth.se).

Bilaga 1 - Kurslista

Bilaga 2 - Inriktningsbeskrivningar



# Bilaga 1: Kurslista

Masterprogram, marina system (TMRSM)

Gemensamma kurser

Årskurs 1

Obligatoriska kurser (35,0 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">SD2411</a>	Lättkonstruktioner och FEM	8,0 hp	Avancerad nivå
<a href="#">SD2703</a>	Marin dynamik	8,0 hp	Avancerad nivå
<a href="#">SD2707</a>	Marin innovation	5,0 hp	Avancerad nivå
<a href="#">SD2708</a>	Skrovkonstruktion	6,0 hp	Avancerad nivå
<a href="#">SD2710</a>	Marinteknik <i>För studenter som ej gjort kandidatexamensarbete i Marina system</i>	8,0 hp	Avancerad nivå

## Valfria kurser

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">AL2161</a>	Miljömanagement II, fördjupningskurs	7,5 hp	Avancerad nivå
<a href="#">AL2191</a>	Teknik och hållbar utveckling	7,5 hp	Avancerad nivå
<a href="#">ME2016</a>	Project Management: Leadership and Control	6,0 hp	Avancerad nivå
<a href="#">ME2818</a>	Design tänkande	7,5 hp	Avancerad nivå
<a href="#">MF2047</a>	Förbränningsmotorteknik 1	6,0 hp	Avancerad nivå
<a href="#">MG1010</a>	Svetsteknologi, allmän kurs	6,0 hp	Grundnivå
<a href="#">SD1105</a>	Matlab	3,0 hp	Grundnivå
<a href="#">SD2125</a>	Signaler och mekaniska system	6,0 hp	Avancerad nivå
<a href="#">SD2140</a>	Strukturakustik	8,0 hp	Avancerad nivå
<a href="#">SD2155</a>	Strömningsakustik	6,0 hp	Avancerad nivå
<a href="#">SD2415</a>	Processmodellering för kompositillverkning	6,0 hp	Avancerad nivå
<a href="#">SG2211</a>	Fordonsaerodynamik	6,0 hp	Avancerad nivå
<a href="#">SG2218</a>	Turbulens	7,5 hp	Avancerad nivå

## Rekommenderade kurser

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">SD2702</a>	Marindesign <i>10 hp läses på våren i åk 1, och 10 hp på hösten i åk 2.</i>	20,0 hp	Avancerad nivå
<a href="#">SD2706</a>	Segling för prestanda	6,0 hp	Avancerad nivå

## Kompletterande information

Obligatoriska kurser + spårkurser 75 hp.

## Årskurs 2

### Obligatoriska kurser (7,5 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">AK2036</a>	Vetenskapsteori och vetenskaplig metodik med tillämpningar (naturvetenskap)	7,5 hp	Avancerad nivå

### Valfria kurser

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">ME1003</a>	Industriell ekonomi, grundkurs	6,0 hp	Grundnivå
<a href="#">MF2047</a>	Förbränningsmotorteknik 1	6,0 hp	Avancerad nivå
<a href="#">MG1010</a>	Svetsteknologi, allmän kurs	6,0 hp	Grundnivå
<a href="#">SD2705</a>	Höghastighetsfartyg	6,0 hp	Avancerad nivå
<a href="#">SD2709</a>	Undervattensteknik	7,5 hp	Avancerad nivå
<a href="#">SG2218</a>	Turbulens	7,5 hp	Avancerad nivå

### Kompletterande information

Obligatoriska kurser + spårkurser 75 hp.

## Spår, lättviktskonstruktioner (MRSA)

## Årskurs 1

### Obligatoriska kurser (18,0 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">SD2413</a>	Fiberkompositer- analys och design	6,0 hp	Avancerad nivå
<a href="#">SD2414</a>	Fiberkompositer - material och tillverkning	6,0 hp	Avancerad nivå
<a href="#">SD2416</a>	Strukturoptimering och sandwichdesign	6,0 hp	Avancerad nivå



## Årskurs 2

### Obligatoriska kurser (6,0 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">SD2416</a>	Strukturoptimering och sandwichdesign	6,0 hp	Avancerad nivå

## Spår, strömningsmekanik (MRSB)

### Årskurs 1

### Obligatoriska kurser (20,0 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">SG2212</a>	Strömningsmekaniska beräkningar	7,5 hp	Avancerad nivå
<a href="#">SG2214</a>	Strömningsmekanik	7,5 hp	Avancerad nivå
<a href="#">SG2224</a>	Tillämpade strömningsmekaniska beräkningar	5,0 hp	Avancerad nivå

## Spår, management (MRSD)

### Årskurs 1

### Obligatoriska kurser (25,5 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">AL2160</a>	Miljömanagement	7,5 hp	Avancerad nivå
<a href="#">ME1003</a>	Industriell ekonomi, grundkurs *	6,0 hp	Grundnivå
<a href="#">ME2016</a>	Project Management: Leadership and Control *	6,0 hp	Avancerad nivå
<a href="#">ME2053</a>	Logistik & Supply Chain Management	6,0 hp	Avancerad nivå

## Kompletterande information

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

## Årskurs 2

### Obligatoriska kurser (7,5 Högskolepoäng)

Kurskod	Namn	Omfattning	Utbildningsnivå
<a href="#">AL2181</a>	Miljösystemanalys och beslutsfattande	7,5 hp	Avancerad nivå



# Bilaga 2: Inriktningar

## Masterprogram, marina system (TMRSM)

### Spår, lättviktskonstruktioner (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](mailto:danz@kth.se), 08-7906435.

### Spår, strömningsmekanik (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 Fluid Mechanics track is Luca Brandt, [luca@mech.kth.se](mailto:luca@mech.kth.se), 08-7906870.

# Spår, 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](mailto:monika@kth.se), 08-7906150.