Utbildningsplan

Masterprogram, marina system
Master's Programme, Naval Architecture, 120 credits

120,0 högskolepoäng

Gäller för antagna till utbildningen fr o m HT10.

Utbildningens mål

The main objective of this program is to educate skilled engineers for industry and research institutions. The subject is multi-disciplinary with strong emphasis on systems engineering. A naval architect needs knowledge about the complete processes of design, implementation and operation of marine vessels which can be very large and complex systems, as well as deep understanding in subjects such as structural and fluid mechanics and related applications. The program further enables specialization within the different profile areas Lightweight Structures, Fluid Mechanics, Sound & Vibration, Management, and Sustainable Development. The subject hence is attractive also for students who are not devoted to work in the maritime sector and relevant for careers also in other fields.

Kunskap och förståelse

A Master of Science in Naval Architecture 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.

Färdigheter och förmågor

A Master of Science in Naval Architecture 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.

Värderingsförmåga och förhållningssätt

A Master of Science in Naval Architecture 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 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 program
contains a naval architecture specific core, referred to as the Major, which covers the international
understanding of the theoretical contents of a master program in naval architecture. In addition to the
Major each student also choose one out of five different profile areas – Lightweight Structures, Fluid
Mechanics, Sound & Vibration, Management, and Sustainable Development. There are also a large set of
elective courses, which enables complementation or further specialization in naval architecture theory and
application and in the profile areas or generalization and broadening of the education depending on the
preferences of the individual student.

Behörighet och urval

Basic eligibility requirements

A completed Bachelor's degree, equivalent to a Swedish Bachelor's degree (180 university credits), from a
university recognized by government or accredited by other recognized organization. A good knowledge
of written and spoken English. Applicants must provide proof of their proficiency in English.

Specific eligibility requirements

A completed Bachelor's degree in vehicle engineering, mechanical engineering or similar is required.

Selection process

The selection process is based on a total evaluation of the following criteria: University, Grade Point
Average (GPA), and motivation letter. Courses on relevant topics such as fluid mechanics, structure
mechanics, complex analysis, partial differential equations, and control theory are considered an additional
qualification. Complete information on the eligibility requirements can be found at the local admission
policy of KTH, see http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/antagnings/1.27186
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 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.

Kurser

Utbildningen sker i kursform. Kurslistor finns i bilaga 1.

Of the course based part of the program (the first 90 university credits), the Major which corresponds to approximately 40 university credits and the chosen profile which corresponds to approximately 20 university credits are mandatory. Courses should also be selected from the pool of conditionally selective courses to reach a total of 75 credits. This leaves 15 credits for totally free courses. A comprehensive list of the courses in the Major, the profiles and the conditionally selective courses is 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 Profile 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

Bilaga 1 - Kurslista
Bilaga 2 - Inriktningsbeskrivningar
## Bilaga 1: Kurslista

Masterprogram, marina system (TMRSM), Utbildningsplan för kull HT2010

### Utbildningsplan

Beslutad utbildningsplan som PDF:

- Gällande för kull HT2010

### Gemensamma kurser

#### Årskurs 1

**Obligatoriska kurser (27,0 Högskolepoäng)**

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2411</td>
<td>Lättkonstruktioner och FEM</td>
<td>8,0 hp</td>
</tr>
<tr>
<td>SD2707</td>
<td>Marin innovation</td>
<td>5,0 hp</td>
</tr>
<tr>
<td>SD2708</td>
<td>Skrovkonstruktion</td>
<td>6,0 hp</td>
</tr>
<tr>
<td>SD2710</td>
<td>Marinteknik</td>
<td>8,0 hp</td>
</tr>
<tr>
<td></td>
<td>För studenter som ej gjort kandidatexamensarbete i Marina system</td>
<td>Avancerad nivå</td>
</tr>
</tbody>
</table>

**Valfria kurser**

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2702</td>
<td>Marindesign</td>
<td>20,0 hp</td>
</tr>
<tr>
<td></td>
<td>10 hp läses på våren i år 1, och 10 hp på hösten i år 2.</td>
<td>Avancerad nivå</td>
</tr>
<tr>
<td>SD2706</td>
<td>Segling för prestanda</td>
<td>6,0 hp</td>
</tr>
</tbody>
</table>

**Villkorligt valfria kurser**

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH2010</td>
<td>Projektstyrning</td>
<td>7,5 hp</td>
</tr>
</tbody>
</table>
FSD3705 Dimensionering av snabba fartyg 6,0 hp Forsknivå
ME1000 Industrial Management 6,0 hp Grundnivå
ME1032 Industriell dynamik, grundkurs 6,0 hp Grundnivå
ME2034 Management of New Technology and Industrial Creativity 6,0 hp Avancerad nivå
ME2036 Industriell dynamik, avancerad kurs 6,0 hp Avancerad nivå
ME2057 Människa-Tekniksystem: Utveckling och Design 6,0 hp Avancerad nivå
ME2800 Ideation - Creating a Business Idea 7,5 hp Avancerad nivå
MJ2611 Introduction Industrial Ecology 6,0 hp Avancerad nivå
MJ2652 Miljökonsekvenser av tekniska system och processer 6,0 hp Avancerad nivå
MJ2663 Miljömanagement 6,0 hp Avancerad nivå
MJ2680 Miljösystemanalys 6,0 hp Avancerad nivå
MJ2691 Teknik och hållbar utveckling 6,0 hp Avancerad nivå
MJ2693 Hållbar utveckling i teori och praktik 6,0 hp Avancerad nivå
SD2130 Signalanalys 8,0 hp Avancerad nivå
SD2140 Strukturakustik 8,0 hp Avancerad nivå
SD2150 Experimentell strukturdynamik, projektkurs 9,0 hp Avancerad nivå
SD2155 Strömningsakustik 6,0 hp Avancerad nivå
SD2175 Numeriska metoder för akustik och vibrationer 9,0 hp Avancerad nivå
SD2413 Fiberkompositer- analys och design 6,0 hp Avancerad nivå
SD2414 Fiberkompositer - material och tillverkning 6,0 hp Avancerad nivå
SD2416 Strukturoppriming och sandwichdesign 6,0 hp Avancerad nivå
SE2123 Hållfasthetsteknisk provning 6,0 hp Avancerad nivå
SG2211 Fordonsaerodynamik 6,0 hp Avancerad nivå
SG2212 Strömningsmekaniska beräkningar 7,5 hp Avancerad nivå
SG2214 Strömningsmekanik 7,5 hp Avancerad nivå
SG2218 Turbulens 7,5 hp Avancerad nivå
SG2224 Tillämpade strömningsmekaniska beräkningar 5,0 hp Avancerad nivå

Kompletterande information

Obligatoriska kurser + spårkurser + villkorligt valfria kurser 75 hp.

Bland de villkorligt valfria courserna finns även Oceanografi och Meteorologi som ges av Stockholms universitet.

Årskurs 2

Obligatoriska kurser (15,5 Högskolepoäng)

Kurskod Kursnamn Omfattning Utb. nivå
AK2036 Vetenskapsteori och vetenskaplig metodik med tillämpningar (naturvetenskap) 7,5 hp Avancerad nivå
SD2703 Marin dynamik 8,0 hp Avancerad nivå
## Valfria kurser

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>SD2702</td>
<td>Marindesign</td>
<td>20,0 hp</td>
</tr>
<tr>
<td>SD2706</td>
<td>Segling för prestanda</td>
<td>6,0 hp</td>
</tr>
</tbody>
</table>

### Kompletterande information

Obligatoriska kurser + spårkurser 75 hp.

## Spår, lättviktskonstruktioner (MRSA)

### Villkorligt valfria kurser

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2413</td>
<td>Fiberkomposit- analys och design</td>
<td>6,0 hp</td>
</tr>
<tr>
<td>SD2414</td>
<td>Fiberkomposit - material och tillverkning</td>
<td>6,0 hp</td>
</tr>
<tr>
<td>SD2416</td>
<td>Strukturoptimering och sandwichdesign</td>
<td>6,0 hp</td>
</tr>
<tr>
<td>SE1025</td>
<td>FEM för ingenjörstillämpningar</td>
<td>6,0 hp</td>
</tr>
</tbody>
</table>

## Spår, strömningsmekanik (MRSB)

### Villkorligt valfria kurser

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG2212</td>
<td>Strömningsmekaniska beräkningar</td>
<td>7,5 hp</td>
</tr>
<tr>
<td>SG2214</td>
<td>Strömningsmekanik</td>
<td>7,5 hp</td>
</tr>
<tr>
<td>SG2224</td>
<td>Tillämpade strömningsmekaniska beräkningar</td>
<td>5,0 hp</td>
</tr>
</tbody>
</table>

## Spår, ljud och vibrationer (MRSC)

### Villkorligt valfria kurser

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD2130</td>
<td>Signalanalys</td>
<td>8,0 hp</td>
</tr>
<tr>
<td>SD2150</td>
<td>Experimentell strukturdynamik, projektkurs</td>
<td>9,0 hp</td>
</tr>
<tr>
<td>SD2175</td>
<td>Numeriska metoder för akustik och vibrationer</td>
<td>9,0 hp</td>
</tr>
</tbody>
</table>

## Spår, management (MRSD)

### Villkorligt valfria kurser
<table>
<thead>
<tr>
<th>Kurskod</th>
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<th>Omfattning</th>
<th>Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH2010</td>
<td>Projektstyrning</td>
<td>7,5 hp</td>
<td>Avancerad nivå</td>
</tr>
<tr>
<td>ME1000</td>
<td>Industrial Management</td>
<td>6,0 hp</td>
<td>Grundnivå</td>
</tr>
<tr>
<td>ME2053</td>
<td>Logistik &amp; Supply Chain Management</td>
<td>6,0 hp</td>
<td>Avancerad nivå</td>
</tr>
<tr>
<td>ME2054</td>
<td>Inköp &amp; Supply Chain Management</td>
<td>6,0 hp</td>
<td>Avancerad nivå</td>
</tr>
</tbody>
</table>

Kompletterande information
En av ME2053 och ME2054 måste läsas

**Spår, hållbar utveckling (MRSE)**

Villkorligt valfria kurser

<table>
<thead>
<tr>
<th>Kurskod</th>
<th>Kursnamn</th>
<th>Omfattning</th>
<th>Utb. nivå</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ2663</td>
<td>Miljömanagement</td>
<td>6,0 hp</td>
<td>Avancerad nivå</td>
</tr>
<tr>
<td>MJ2670</td>
<td>Riskmanagement</td>
<td>6,0 hp</td>
<td>Avancerad nivå</td>
</tr>
<tr>
<td>MJ2691</td>
<td>Teknik och hållbar utveckling</td>
<td>6,0 hp</td>
<td>Avancerad nivå</td>
</tr>
</tbody>
</table>
Bilaga 2: Inriktningar

Masterprogram, marina system (TMRSM), Utbildningsplan för kull HT2010

Utbildningsplan

Beslutad utbildningsplan som PDF:

- Gällande för kull HT2010

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 profile Lightweight Structures is Dan Zenkert, 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 uncompressible 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 is Erik Lindborg, erikl@mech.kth.se, 08-7906801.
Spår, ljud och vibrationer (MRSC)

Issues related to sound and vibrations are numerous in ship design. For example in passenger ships, both acoustic and vibration criteria are increasingly important as demands for comfort increases. There are many sources of vibration in ships. The major sources are the engine and fluctuating pressure pulses and cavitation from the propeller which hits the hull. Many other systems and appliances also cause sound and vibration such as ventilation installations, external waves hitting the ship and various pumps. The profile in Sound & Vibration treats the topic from many aspects ranging from analytical understanding of the phenomena, numerical methods of modelling and solving complex dynamic problems as well as experimental investigations by modal analysis. An engineer with this profile will be able to work with both details regarding generation as well as propagation and reduction of sound and vibration in complex structures.

Contact person for the profile Sound & Vibration is Hans Bodén, hansbod@kth.se, 08-7904962.

Spår, management (MRSD)

As an Engineer in the Naval Architecture field, your work will not only include purely technical activities. It is also important to understand the way businesses are made and the way the industry changes. Managerial issues will almost always be intertwined with the technical tasks that you have to face. In the profile Management, you will learn how to deal with the interface between marine technology, shipping, management, and industry development. This profile focuses on the problems in industries of this kind, how the companies produce different types of products and services that are important in the field, and how this type of companies, often project-based and cooperating with suppliers and customers, can be managed. The profile aims at providing in-depth knowledge of the financial, organizational and management aspects of a company in the maritime field. Emphasis is on the ability to manage and control projects in these contexts, the connection between business strategy and the management, and the risks and opportunities associated with globalization with respect to the industry. It gives a good foundation for an employment as a manager for companies and projects within the 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 in the field, e.g. a consulting firm in the Naval Architecture field.

Contact person for the profile Management is Håkan Kullvén, hakan.kullven@indek.kth.se, 08-7906052.

Spår, hållbar utveckling (MRSE)

Shipping is, and will continue to be, one very important driving force in the development of most parts of the world and will therefore also be a part of development of new technologies to reach a sustainable global usage of the limited resources of the earth. The profile in sustainable development is based on the concept of Industrial Ecology with focus on the understanding of interactions between technical, economical, social and ecological systems and processes, a very important aspect for shipping, on global, national and company level. The profile will lead to understanding of the concepts of sustainable development from an environmental, social and economical viewpoint as well as the ecological prerequisites. The profile studies will include strategies for sustainable development and the role of technology, ecosystems’ long-term sustainability, material and energy flows within industry and society, tools and methods to work with sustainable development in industry and society with an emphasis on systems analysis methods.
Contact person for the profile Sustainable Development is Nils Brandt, nilsb@kth.se, 08-7908059.