



Programme syllabus

[An accessible version of the syllabus can be found in the Course and programme directory.](#)

Master's Programme, Aerospace Engineering 120 credits

Masterprogram, flyg- och rymdteknik

Valid for students admitted to the education from autumn 11 (HT - Autumn term; VT - Spring term).

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

Programme objectives

The main objective of this programme is to educate skilled engineers for the European aerospace industry and research institutions. The programme is mainly intended for (but not exclusive to) Swedish students and students from European universities with which KTH has exchange agreements. It is a joint effort by several different KTH departments, providing leading expertise in their respective areas of research. The Department of Aeronautical and Vehicle Engineering coordinates the programme and contributes about half of the courses.

Knowledge and understanding

A Master of Science in Aerospace Engineering will:

- have a good ability to independently apply mathematics and basic engineering science in the field of aerospace engineering,

- be able to formulate and approach new problem settings in a scientific manner, by having a creative, critical and systematic attitude to engineering practice.

Skills and abilities

A Master of Science in Aerospace Engineering will be able to:

- work out solution strategies to real engineering problems, knowing the capabilities and limitations of different methods and tools,
- plan, perform and evaluate basic experimental testing in order to investigate the validity of a theoretical model,
- work efficiently in a teamwork environment in groups with different compositions,
- work efficiently in an international environment, in particular where English is the professional language,
- communicate results and conclusions in a competent and intelligible manner, both orally and in writing,
- follow and participate in aerospace research and development.

Ability to make judgements and adopt a standpoint

A Master of Science in Aerospace Engineering will be able to:

- critically judge a situation and in an independent manner acquire the information and knowledge that is necessary to establish a qualified standpoint,
- have the 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 be found at the local degree policy of <http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina>

Extent and content of the programme

Aerospace Engineering is a two-year (120 university credits) master programme on the advanced level (second cycle). The instruction language is entirely in English. The programme consists of a basic curriculum followed by four different tracks in aeronautics, space, structures or systems. The courses in the basic curriculum are compulsory and constitutes about one third the course work. In each track there is an additional set of compulsory courses to ensure that the students are qualified to perform a final Master's thesis project.

Eligibility and selection

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

The applicant must have a basic degree, Bachelor's or similar, from an aeronautical, mechanical engineering, or similar programme with sufficient theoretical depth and good academic results. Course work must include multivariable calculus, linear algebra, numerical analysis, ordinary differential equations, rigid body mechanics, solid mechanics, and fluid mechanics.

Selection process

The selection process is based on a total evaluation of the following criteria: University, Grade Point Average (GPA), and relevant course work. Courses on topics such as complex analysis, partial differential equations, thermodynamics, 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/antagning/1.27192>

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 consisting of two extra days and at least 5 exam days. 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 lasts for a duration of 40 weeks. Teaching activities may, if necessary, be scheduled outside the academic year.

In order to give a broad and interesting introduction to the field, the first semester consists of one introductory course in each major discipline (aeronautics, space, structures and systems, respectively). The second semester offers a number of more advanced courses, that depends on the chosen track. Finally, the second year mainly consists of elective courses and the final degree project.

Courses

The programme is course-based. Lists of courses are included in appendix 1.

The programme is course-based. Lists of courses are included in Appendix 1. The basic curriculum corresponds to approximately 40 university credits. In each track, there is an additional set of three compulsory courses, corresponding to approximately 20 university credits. This leaves approximately 30 university credits for optional (elective) courses. The optional courses should be on the advanced level, and preferably be related to aerospace engineering.

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 programme.

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, see <http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/prestationer/1.27200>

Degree project

Students admitted to the programme 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 and at least two of the three compulsory courses in the track.

The purpose of the thesis project is that the student should demonstrate the ability to perform independent project work, using and developing the skills obtained from the courses in the programme. The thesis project can either be performed at a university or, more commonly, at a company in the aerospace sector 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>

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>

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



Appendix 1: Course list

Master's Programme, Aerospace Engineering (TAEEM)

General courses

Year 1

Mandatory courses (35.0 Credits)

Code	Name	Credits	Edu. level
AK2030	Theory and Methodology of Science (Natural and Technological Science)	4.5 hp	Second cycle
SD2411	Lightweight Structures and FEM	8.0 hp	Second cycle
SD2601	Fundamentals of Flight	7.5 hp	Second cycle
SD2816	Rocket Science	7.5 hp	Second cycle
SF2863	Systems Engineering	7.5 hp	Second cycle

Aeronautics (FLT)

Year 1

Mandatory courses (15.0 Credits)

Code	Name	Credits	Edu. level
SD2800	Experimental Aerodynamics	6.0 hp	Second cycle
SD2805	Flight Mechanics	9.0 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
EL2520	Control Theory and Practice, Advanced Course	7.5 hp	Second cycle
SD2810	Aeroelasticity	9.0 hp	Second cycle
SG2215	Compressible Flow	7.5 hp	Second cycle

Year 2

Mandatory courses (9.0 Credits)

Code	Name	Credits	Edu. level
SD2611	Aerodynamic Design of Aircraft	9.0 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
EH2720	Management of Projects	7.5 hp	Second cycle
MJ2241	Jet Propulsion Engines, General Course	6.0 hp	Second cycle
SG2805	Spacecraft Dynamics	9.0 hp	Second cycle

Lightweight Structures (LKR)

Year 1

Mandatory courses (12.0 Credits)

Code	Name	Credits	Edu. level
SD2413	Fibre Composites - Analysis and Design	6.0 hp	Second cycle
SD2414	Fibre Composites - Materials and Manufacturing <i>For students who has not done Degree project, first level, in Lightweight Structures.</i>	6.0 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
SD2432	Lightweight Design	20.0 hp	Second cycle
SD2810	Aeroelasticity	9.0 hp	Second cycle
SE2129	Fracture Mechanics and Fatigue	9.0 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

Optional courses

Code	Name	Credits	Edu. level
EH2720	Management of Projects	7.5 hp	Second cycle
SD2415	Process Modelling for Composite Manufacturing	6.0 hp	Second cycle
SD2432	Lightweight Design	20.0 hp	Second cycle
SD2450	Biomechanics and Neuronics	6.0 hp	Second cycle

Space (RMD)

Year 1

Optional courses

Code	Name	Credits	Edu. level
AH2923	Global Navigation Satellite Systems (GNSS)	7.5 hp	Second cycle
EL2520	Control Theory and Practice, Advanced Course	7.5 hp	Second cycle
SD2805	Flight Mechanics	9.0 hp	Second cycle
SG2215	Compressible Flow	7.5 hp	Second cycle

Year 2

Mandatory courses (21.0 Credits)

Code	Name	Credits	Edu. level
EF2240	Space Physics	6.0 hp	Second cycle
EF2260	Space Environment and Spacecraft Engineering	6.0 hp	Second cycle
SG2805	Spacecraft Dynamics	9.0 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
EF2200	Plasma Physics	6.0 hp	Second cycle
EF2245	Space Physics II	7.5 hp	Second cycle
EH2720	Management of Projects	7.5 hp	Second cycle
EL2620	Nonlinear Control	7.5 hp	Second cycle

Systems Engineering (SYS)

Year 1

Mandatory courses (21.0 Credits)

Code	Name	Credits	Edu. level
EL2520	Control Theory and Practice, Advanced Course	7.5 hp	Second cycle
SF1841	Optimization <i>For students who has not studied corresponding course before</i>	6.0 hp	First cycle
SF2852	Optimal Control Theory	7.5 hp	Second cycle

Optional courses

Code	Name	Credits	Edu. level
EL2450	Hybrid and Embedded Control Systems	7.5 hp	Second cycle
SF2822	Applied Nonlinear Optimization	7.5 hp	Second cycle
SF2832	Mathematical Systems Theory	7.5 hp	Second cycle

Year 2

Optional courses

Code	Name	Credits	Edu. level
EH2720	Management of Projects	7.5 hp	Second cycle
EL2620	Nonlinear Control	7.5 hp	Second cycle
SF2812	Applied Linear Optimization	7.5 hp	Second cycle
SF2842	Geometric Control Theory	7.5 hp	Second cycle



Appendix 2: Specialisations

Master's Programme, Aerospace Engineering (TAEEM)

Aeronautics (FLT)

The track in aeronautics focuses on modeling, analysis and design of aircraft. The overall objectives are that the student should be able to design and estimate the performance of an aircraft, compute its aerodynamic properties, simulate its motion in flight, and analyze how its aerodynamic and structural properties influence stability and control. The track is characterized by a strong interaction between theory and practice, and the student will plan, perform and evaluate several wind tunnel tests during her education. An engineer with this profile is particularly attractive to companies working in aerodynamics and aeronautics.

Lightweight Structures (LKR)

The track in structures focuses on lightweight materials and structures for the development of new engineering solutions and products. Reduced structural weight can be translated into improved structural efficiency, reduced costs for production and maintenance, and reduced environmental impact. Emphasis is put on fibre composites, non-metallic materials and sandwich structures, often used in constructions with extreme requirements. Overall, the student will develop knowledge and skills in analysis, design, optimization, materials, manufacturing and testing of lightweight structures. Fibre composites require a systems approach to the choice of materials, manufacturing processes and product design, which also prepares the student for a future role as an engineer working with development of new products or materials. A structural engineer is attractive to a large number of industries in aerospace-, naval- or automotive engineering, as well as smaller businesses working with manufacturing or innovation.

Space (RMD)

The overall objectives of the space branch are that the student should be able to size and carry out a performance analysis of spacecraft, in particular rockets, and plan a geocentric or interplanetary space mission on a conceptual level. The student will develop knowledge and skills in orbital mechanics and spacecraft dynamics. Particular emphasis is put on the space environment and spacecraft engineering for small and medium size satellites, including their design, instrumentation, navigation and control. As part of the courses in spacecraft engineering, the student will also perform experiments in order to investigate for example power requirements, as well as thermal and radiation effects. An engineer with this profile is particularly attractive to companies working with spacecraft and satellite technology.

Systems Engineering (SYS)

Aircraft, rockets and satellites are very complex systems that are associated with extremely high costs for development and operation. In order to avoid incidents and costs due to malfunctions, the requirements on operational safety are extreme as well. The overall objective with the specialization in systems is that the student should be able to develop mathematical models of systems in order to perform analysis of their performance and reliability. The student should also be able to use such models to improve the efficiency of complex and costly systems (for example an airline), or to design a system such that a malfunction in some part of the system only will have limited consequences for the system as a whole. A systems engineer is attractive to a large number of industries in various fields.