



# Programme syllabus

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

## Degree Programme in Engineering Physics 300 credits

Civilingenjörsutbildning i teknisk fysik

*Valid for students admitted to the education from autumn 12 (HT - Autumn term; VT - Spring term).*

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

### Programme objectives

#### **The programme's aim**

Engineering physics comprises basic mathematics and natural science and their technical applications. The study programme gives a broad knowledge base which can be applied within widely varying fields.

#### **The programme's objectives**

For the Master of Science in Engineering Physics degree, the student must fulfill the objectives which are stated in the Higher Education Degree Ordinance for Master of Science degrees.

# Knowledge and understanding

For the Master of Science in Engineering degree, the student should:

- show such knowledge and abilities which are needed in order to independently work as a Master of Science in Engineering
- show knowledge about the chosen specialisation area's scientific foundation and its tested experience and insight into current research and development work
- Show such a broad ability within the chosen technical area including knowledge in mathematics and natural science as well as essentially deepened knowledge within certain parts of the area.

In addition, students in Master of Science in Engineering Physics should:

- show broad ability which can be applied even within areas beyond the chosen specialisation
- Be a master of advanced mathematical methods and their applications within the different areas.

# Skills and abilities

For a Master of Science in Engineering degree, the student should:

- show an ability to identify, formulate and handle complex problems creatively, critically and independently, analyze and critically evaluate different technical solutions and participate in research and development work and, with that, contribute to knowledge development.
- show an ability to critically and systematically integrate knowledge and show an ability to model, simulate, predict and assess occurrences, even with limited information
- show an ability to plan and with adequate methods carry out sophisticated assignments within given boundaries
- show an ability to develop and manufacture products, processes and systems with regards to humanity's conditions and needs and society's goals for sustainable development.
- Show an ability to present and discuss one's conclusions, knowledge, and arguments that founded the conclusion clearly in writing and orally in both a national and international settings, and in dialogue with different target groups.

For a Master of Science in Engineering Physics, the students should especially:

- be able to quickly recognise technical and natural scientific information even within an unknown area and apply this to problems/inquiries within certain broad fields
- show an ability for problem solving even within areas beyond the chosen masterprogram
- show an ability to choose and apply advanced mathematical methods within certain broad fields
- Show an ability to plan, choose methods for and carry out investigations through modelling and simulation or through measurement, and assessment of results.

# Ability to make judgements and adopt a standpoint

For a Master of Science in Engineering degree, the student should:

- Show the ability to make judgments with regards to relevant scientific, social, and ethical aspects and show awareness of ethical aspects of research and development work.
- show insight into the technology's possibilities and limitations, its role in society and humanity's responsibility for how it is used, including social, economical and environmental aspects
- show insight about and ability to work as a team and cooperate as a team with different groups
- Show the ability to identify one's needs for further knowledge and continuously develop one's skills and abilities

# Extent and content of the programme

The Bachelor of Science programme in Engineering Physics consists of 300 credits, which at a normal study pace, corresponds to 5 years of full-time study. The programme's first three years are in the first cycle and can, if the student applies to do so, be concluded with a technology bachelor's degree. The last 2 years are in the second cycle.

The first three years of the programme are mainly in Swedish, with certain English literature included. The last 2 years are mainly in English.

# Eligibility and selection

For eligibility requirements and selection methods, see KTH's admission policy

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/antagning>

In addition a part of the students in the first grade are admitted through one, for the students, voluntary Mathematics and physics test.

[www.matematik-och-fysikprovet.se](http://www.matematik-och-fysikprovet.se).

For applicants to the latter part of the engineering programs, architecture and bachelor programs require completion of courses equivalent to at least 45 credits of required courses in applied programs at KTH, which at least 35 credits shall be of grade 1 on the program applications.

If there are more qualified applicants for the latter part of the Engineering Physics than seats available a selection according to the following criteria is done:

First priority corresponding number of points in Engineering Physics at KTH. Then, at about the equivalent number of points, grades in mathematics courses are prioritized.

# Implementation of the education

## Structure of the education

The study year for KTH's education is divided into four periods. Every study period is followed by an exam period consisting of two rest days and at least five test days. Beyond the four ordinary exam periods, there are three re-exam periods given: after Christmas, after the study year's last ordinary exam period and directly before the study years first study period.

The study year consists of 40 weeks. Under certain circumstances, studies can take place outside the study year.

## Courses

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

The programme is composed of obligatory and elective courses. The obligatory courses are defined for every course in the teaching and time schedules. The different courses' goals, prerequisites, contents and course examination specifications, can be found in the course plans.

### **Technique Complementary courses**

Most of the training should be within the technical field Engineering physics.

In addition to this in Engineering Physics there is an opportunity for a maximum of 25 credits technology complementary courses, as courses in language, economics, management and philosophy. This applies if the other requirements of the levels and depth for the degree are met. Technique complementary courses can either be read at KTH or at another university and be counted (see section on accreditation). However, the following restrictions:

- Technical complementary courses may not overlap existing program courses
- Preparatory courses for higher education may not count as technical complementary courses
- Courses within the subject on a lower level than the existing program courses may not be counted as technical complementary courses.
- The application to receive credits for course within the framework of technology complementary courses in Master of Science degree in Engineering Physics student should justify how the course fits into the student's profile on the program. The application is assessed and approved by the program director.

# 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.

When the grading systems differ very much between different countries, the grades from studies abroad will not be transferred to the KTH grading system.

## Conditions for participation in the programme

### Conditions for being promoted to the next level

The following conditions apply in order to participate in the next study year:

#### *For studies in year 2:*

At least 45 credits from study year 1 must be completed up to the August period.

#### *For studies in year 3:*

At least 90 credits from study years 1 and 2 must be completed up to the August period, of which 50 credits has to be from the first year. Students who have not met the requirements above must meet with a study plan counsellor and create an individual study plan in order to continue.

#### *Requirements for advancement from grade 3 to grade 4:*

A total of at least 150 credits from grades 1-3 to be completed through August period, with at least 110 credits from grades 1-2. For students in the study for a Bachelor's degree includes an obligatory part, this shall be completed prior studies in year 4 begins.

#### *Registration and promotion to grade 4 in engineering programs:*

Prior to graduate studies in grades four in engineering programs, students should choose a master program. Which Degree leading to M.Sc. shown in Science program's curriculum. **Choice of Masters takes place during the period May 1 to 15.** From the autumn term 2012 choice and admission of the masters program is administrated by the Division of Student Service. To the master leading to M.Sc. is no place limitation. Master Students who wish to choose a program that does not lead to an MSc make their choice in the external admissions round in January, for these may place restrictions occur.

For advancement (permission) to grade 4 / admission to master's student in the five-year training program, the following requirements:

- A total of at least 150 credits from grades 1-3 have to be completed and of those at least 110 credits from grades 1 - 2.

- The course for Bachelor Degree project, first level, must be completed prior studies in the masters program year 1 begins.

In addition, there are special eligibility requirements for each master.

Students who have chosen a masters program before grade 4 in the MSC program and is authorized to it will be registered on it.

### **Semester Registration**

The student is responsible for making semester registration for each semester. This is done via My pages from 1 week before the semester even 1 week after the semester. Registration means that the student is active and is in turn a prerequisite for the study results to be reported and to CSN to pay the awarded student.

### **Course registration**

Registration of a course assumes course selection in Ladok. The course selection process can be done on the web or through the student's programme office. Registration of a course is done by the department giving the course. Registration must be finished by around three weeks after the course's start. If the student decides to withdraw from a course, the student must notify the institution of this.

### **General master with individual course package**

Within the engineering program, it is possible to put together combinations of courses at the advanced level to a general Masters with an individual course package. However, it may be appropriate to first determine which choice available within the existing master's programs.

To read an individual course package an application for individual course package is required. Form is available here: [http://www.kth.se/dokument/student/sci/blankett/individuell\\_studieinriktning.pdf](http://www.kth.se/dokument/student/sci/blankett/individuell_studieinriktning.pdf)

In the application, the idea with the individual course package has to be formulated and the courses to be included defined. Regarding the thesis there must be a preliminary approval sought from a possible examiner at the appropriate department.

It is the student's responsibility to check if the courses are offered each year, or if there are other subject if and when a course will be given. It's important to know that an individual course package involves a certain amount of unavoidable scheduling conflicts.

The application submitted to the Office of SCI over the same period as the master of selection (1-15 May). Decision on the application is approved or not taken by the program coordinator and information sent by e-mail.

## **Recognition of previous academic studies**

The right to the recognition of previous academic studies is an important element in order to support the mobility within the country and between countries, for the higher education's internationalization work, and for "life-long" learning. KTH must have an open method to recognize previous academic studies. Recognition must therefore happen even if the exact programme does not exist at KTH or if

the contents in, for example, the course plans does not exactly correspond to KTH's. The requirements which KTH normally applies to programme level and quality will be considered in the recognition of previous academic studies. Recognition which is decided at another institution in Sweden will normally be accepted by KTH.

A student at KTH who carries out studies at another university within the boundaries of an exchange agreement has the right to receive advanced notification about recognition of previous studies. Such a notification can, for example, be given through a Learning Agreement which must be established and signed by the coordinator at KTH, contact person at the university abroad and the student.

The student at KTH has the right to receive a trial recognition of previous academic studies.

Even degree project work can be recognized. KTH considers it, nevertheless, appropriate that the degree project work is performed at KTH (within a school or at a company with a supervisor from KTH).

The decision about the recognition of courses can be appealed at the Board of Appeals of higher education. The appeal must be submitted to KTH, at the latest, three weeks from the day that the student received the decision.

In order for a trial recognition of previous academic studies, the applicant must normally be able to document that he/she has graduated in courses (corresponding) with at least passing results. The study performance is graded by the university where the exam was taken, not by the recognition of KTH.

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

## Studies abroad

In engineering programs, it is possible to read parts of the studies under one of KTH's exchange agreements. Please contact the international coordinator at the office: [exchange-out@sci.kth.se](mailto:exchange-out@sci.kth.se). The application period for a replacement is in the middle of January and most contracts are written for one year of study and or thesis.

More and detailed information about exchange studies can be found here:

[http://www.kth.se/student/utlandsstudier?l=sv\\_SE&programme=f](http://www.kth.se/student/utlandsstudier?l=sv_SE&programme=f)

## Degree project

### **Bachelor**

The program includes a thesis for the degree (first level) in the spring of year 3 of 15 credits. This represents approximately 5 months of half-time studies. To be allowed to begin the work at least 120 credits, of which 105 credits from the deck block, must be completed not later than 20th of December.

### **Master of Engineering**

In the programme, a degree project must be done corresponding to a course of 30 credits which implies around 5 months of full-time studies.

- The degree project is normally carried out within the central subject for the programme's technical area
- The degree project may not be started before the assignment is approved by the examiner at the chosen institution and is submitted to the programme office using a special form.
- The main part of the studies, at least 240 credits, must be completed. The student may not have more than two unfinished courses of the obligatory base block in years 1-3.
- The examiner is responsible to ensure that the student has the appropriate knowledge for the chosen assignment.
- The degree project is founded on that knowledge which has been attained throughout the entire study time and must normally be carried out during the last term within the masters programme which the student chose. If the student wishes to carry out the degree project within another subject area, this must be approved by the programme office.
- The degree project is done at the end of the programme in order to show that the student is capable of independently applying his/her knowledge attained during the study time.
- The degree project should show evidence of an independent, engineering-related/scientific work consisting of theoretical and/or experimental work with a corresponding written report. The degree project can include other items, for example, seminars, information gathering, student teaching, opposition, or other elements which the examiner or supervisor deems to be appropriate.
- The degree project is carried out individually or together with another student. In the latter case, the examiner ensures that each student's work corresponds to the demands for an individual project work.
- The supervisor is appointed by the examiner.

The application form for the degree project ([link](#)) must be signed by the student and the examiner, before submitted to the programme office. More detailed rules and guidelines for the degree project can be found at the respective institution.

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete>

Link to grading of diploma work:

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examensarbete/1.31698>

## Degree

### Conditions for the degree

#### *The 300 credit degree*



The Master of Science in Engineering degree is received after completing the programme. The programme is designed so that the student receiving the degree fulfils the national degree requirements and has fully completed courses corresponding to 300 credits, whence

- The mathematical/natural scientific subjects compose at least 45 credits and at least 180 (including 30 credits of degree project work) in the subjects central to the technical area.
- At least 90 credits in the second cycle, where at least 60 credits (including 30 credits of degree project work) in the subjects central to the technical area.

The name of the degree is a Master of Science in Engineering Degree.

### **Application for the degree**

The student has the possibility to apply for three different degrees: Bachelor of Technology, Master of Science in Engineering, and Master's Degree. The application form for the degree is found at the personal menu at [www.kth.se](http://www.kth.se).

<http://intra.kth.se/regelverk/utbildning-forskning/grundutbildning/examina>

Appendix 1 - Course list

Appendix 2 - Programme syllabus descriptions



# Appendix 1: Course list

## Degree Programme in Engineering Physics (CTFYs)

### General courses

Year 1

#### Mandatory courses (60.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">DD1345</a>	Fundamentals of Programming and Computer Science	7.5 hp	First cycle
<a href="#">SF1602</a>	Calculus II, part 1	9.0 hp	First cycle
<a href="#">SF1603</a>	Calculus II, part 2	9.0 hp	First cycle
<a href="#">SF1604</a>	Linear Algebra	7.5 hp	First cycle
<a href="#">SG1130</a>	Mechanics I	9.0 hp	First cycle
<a href="#">SI1121</a>	Thermodynamics	6.0 hp	First cycle
<a href="#">SK1102</a>	Classical Physics	12.0 hp	First cycle

## Optional courses

Code	Name	Credits	Edu. level
<a href="#">DD1301</a>	Computer Introduction	1.5 hp	First cycle
<a href="#">SF1611</a>	Introductory Course in Mathematics I	1.5 hp	First cycle
<a href="#">SF1647</a>	Extended Analysis and Linear Algebra	8.0 hp	First cycle

## Year 2

### Mandatory courses (68.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">EI1240</a>	Electromagnetic Theory	9.0 hp	First cycle
<a href="#">SE1055</a>	Strength of Materials and Solid Mechanics, Basic Course with Energy Methods	9.0 hp	First cycle
<a href="#">SF1544</a>	Numerical Methods, Basic Course IV	6.0 hp	First cycle
<a href="#">SF1628</a>	Complex Analysis	6.0 hp	First cycle
<a href="#">SF1629</a>	Differential Equations and Transforms II	9.0 hp	First cycle
<a href="#">SF1901</a>	Probability Theory and Statistics	6.0 hp	First cycle
<a href="#">SG1113</a>	Mechanics, Continuation Course	6.0 hp	First cycle
<a href="#">SH1012</a>	Modern Physics	8.0 hp	First cycle
<a href="#">SI1140</a>	Mathematical Methods in Physics	9.0 hp	First cycle

## Supplementary information

EI1240 part 1 is given i period 4. Part 2 is given i period 1 during the third year.

## Year 3

### Mandatory courses (49.0 Credits)

Code	Name	Credits	Edu. level
<a href="#">DD1346</a>	Object-Oriented Program Construction	6.0 hp	First cycle
<a href="#">EL1000</a>	Automatic Control, General Course	6.0 hp	First cycle
<a href="#">IM2601</a>	Solid State Physics	6.0 hp	Second cycle
<a href="#">SA104X</a>	Degree Project in Engineering Physics, First Cycle	15.0 hp	First cycle
<a href="#">SG1215</a>	Fluid Mechanics	4.0 hp	First cycle
<a href="#">SI1151</a>	Quantum Physics	6.0 hp	First cycle
<a href="#">SI1161</a>	Statistical Physics	6.0 hp	First cycle

## Optional courses

Code	Name	Credits	Edu. level
<a href="#">IM2602</a>	Solid State Physics, Extended Course	3.0 hp	Second cycle
<a href="#">SD1120</a>	Noise and Vibration Control	9.0 hp	First cycle
<a href="#">SE1025</a>	FEM for Engineering Applications	6.0 hp	First cycle
<a href="#">SF1811</a>	Optimization	6.0 hp	First cycle
<a href="#">SF1821</a>	Optimization, Specialized Part of the Basic Course	1.5 hp	First cycle
<a href="#">SF1904</a>	Markov Processes, Basic Course	3.0 hp	First cycle
<a href="#">SF2520</a>	Applied Numerical Methods	7.5 hp	Second cycle
<a href="#">SF2521</a>	Numerical Solutions of Differential Equations	7.5 hp	Second cycle
<a href="#">SF2701</a>	Financial Mathematics, Basic Course	7.5 hp	Second cycle
<a href="#">SF2713</a>	Foundations of Analysis	7.5 hp	Second cycle
<a href="#">SF2729</a>	Groups and Rings	7.5 hp	Second cycle
<a href="#">SF2736</a>	Discrete Mathematics	7.5 hp	Second cycle
<a href="#">SF2940</a>	Probability Theory	7.5 hp	Second cycle
<a href="#">SF2950</a>	Applied Mathematical Statistics	7.5 hp	Second cycle
<a href="#">SH2402</a>	Astrophysics	6.0 hp	Second cycle
<a href="#">SI1142</a>	Mathematical Methods in Physics, Additional Course	3.0 hp	First cycle
<a href="#">SI2335</a>	Simulation Physics	6.0 hp	Second cycle
<a href="#">SI2371</a>	Special Relativity	6.0 hp	Second cycle
<a href="#">SI2700</a>	Protein Physics	7.5 hp	Second cycle
<a href="#">SK2411</a>	Laser Physics	7.5 hp	Second cycle
<a href="#">SK2531</a>	Biomedicine for Engineers	12.0 hp	Second cycle

## Supplementary information

Electromagnetic Theory part 2 is given during period 1 fall semester.

The list of elective courses is not complete. This is only examples of courses that can be taken.

## Year 4

### Supplementary information

The last two years of the program are completed within the context of a master's program.

Courses taken within the fourth year will refer back to the first year's annual study plan in the master's program that you have chosen.

The selectable master's programs leading to a Master of Science in Engineering Physics are:

Engineering Physics

Mathematics

Applied and Computational Mathematics

Engineering Mechanics

Nuclear Energy Engineering

Computer Science

Electrophysics

Aerospace Engineering

Vehicle Engineering

Nano Technology

Naval Architecture (not track Management)

Machine Learning

Systems, Control and Robotics

Wireless Systems

# Year 5

## Supplementary information

The last two years of the program are completed within the context of a master's program.

Courses taken within the fifth year will refer back to the second year's annual study plan in the master's program that you have chosen.

The selectable master's programs leading to a Master of Science in Engineering Physics are:

Engineering Physics

Mathematics

Applied and Computational Mathematics

Engineering Mechanics

Nuclear Energy Engineering

Computer Science

Electrophysics

Aerospace Engineering

Vehicle Engineering

Nano Technology

Naval Architecture (not track Management)

Machine Learning

Systems, Control and Robotics

Wireless Systems



# Appendix 2: Specialisations

## Degree Programme in Engineering Physics (CTFYS)

This programme has no specialisations.