



Programme syllabus

Master's Programme, Electrophysics, 120 credits

Masterprogram, elektrofysik

120.0 credits

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 master's programme in Electrophysics focuses on the foundations of electrical engineering: electromagnetic fields and their interaction with matter. Physical principles, mathematical methods, and numerical models make up the core of the programme, providing the tools and skills needed to describe electromagnetic processes and analyse complex systems and problems within the field. Specialised knowledge on relevant applications and systems is offered in the specialization courses, covering areas as antenna theory, propagation and damping of electromagnetic waves in various environments and geometries, plasma theory and applications, magnetohydrodynamics, fusion physics, space physics and technology. Programme graduates will be able to work with development, operation and evaluation of systems requiring good electrical engineering knowledge, or continue with research career in the field. The program sets forward a number of study objectives in terms of knowledge and understanding, skills and judgement.

Knowledge and understanding

For the master's degree, the student should:

- have thorough knowledge about the scientific foundation and common practice of the electrical engineering
- be able to identify electrophysical problems in various technical systems and natural phenomena, and place them in a larger context
- be able to describe technological processes using mathematical models, and to assess the applicability and limitations of the models.

Skills and abilities

For the master's degree, the student should:

- critically select and apply analytical and numerical methods to solve problems in electrophysics

- search and follow technical and scientific literature in electromagnetic theory and close fields
- communicate with various target groups in a professional way
- be able to plan, organize and document the work, and work together in a group.

Ability to make judgements and adopt a standpoint

For the master's degree, the student should:

- be able to analyze electrical engineering problems with a holistic view of technological systems, in an independent manner acquire the information and knowledge that is necessary to establish a qualified opinion.
- have an insight into possibilities and limitations of technology, its role in society, and responsibilities for its application.

The programme provides the students with knowledge and skills that are needed to continue education to the PhD level, and are also attractive for the industry. The education can be a basis for continued studies at research level in electromagnetic field theory, plasma physics, space physics and fusion research, in which some of the courses can be included in the PhD course work. The objective is to give students maximum freedom to choose the courses of the programme of most interest to them. As the students may come from different backgrounds, a set of obligatory courses is offered in the first year to provide a solid foundation in the field.

Extent and content of the programme

The programme is on the second level and has a duration of two years, it comprises 120 higher education credits (equivalent to 120 ECTS). The language of instruction throughout the programme is English.

The specialisation of the programme can be summarised as Plasma, Space and Radio science.

Eligibility and selection

Basic eligibility requirements for second cycle education are given in the admission policy of the Royal Institute of Technology (see KTH-handbook).

Basic admission requirements

Basic eligibility to be accepted to the master's program requires a completed Bachelor's degree, corresponding to a Swedish Bachelor's degree (180 higher education credits), or equivalent academic qualifications with at least 60 ECTS credits of course work in electrical engineering or physics from an internationally recognised university. Students should have in addition, good knowledge in English, oral and written, is required. Applicants must provide proof of their proficiency in English. Specific admission requirements for Electrophysics are:

- at least 30 ECTS credits of course work in mathematics including calculus, vector algebra, differential equations, numerical methods
- courses in basic electromagnetics and mechanics

The specific eligibility requirements can be assessed as not-fulfilled if:

1. the average grade is less than 75% of the highest grade.
2. the degree awarding institution is not considered to meet acceptable quality standards by the authorities of the country in which the institution is located.
3. the degree does not qualify for admission to equivalent Master level in the country where the degree is awarded. The selection process for Electrophysics is based on a total evaluation of the following criteria: university ranking and grade point average, personal motivation, letters of recommendation, course work and professional experience related to the programme.

Implementation of the education

Structure of the education

The education is laid out in two academic years. The study year for KTH's undergraduate programme is divided into four periods. The study periods correspond to about seven weeks of studies with at least 33 study days. Every study period is followed by an exam period consisting of two dispensable days and at least five exam days. Partitioning of the academic year is described in the KTH-handbook and student web page.

Courses

The programme is course-based. Lists of 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. In order to be registered for elective courses in Term 3, you must have completed at least 45 ECTS of course work.

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.

Studies abroad

Exchange studies for course work abroad is not available. The Degree project (Master's Thesis project) can be performed abroad providing the student has an advisor at KTH and one at the receiving institution and that the work follows the KTH regulations for a Thesis project.

Degree project

Degree project corresponds to 30 credit units. In general, the obligatory courses must be completed before the degree project can be started. The degree project is normally carried out individually, and the subject is in normal cases a specialization in the field a student studies for. The programme coordinator can in some cases agree for the degree project to be carried out by two students, in which case individual work by each student should be clearly defined. The degree project is graded on the A-F scale, based on the KTH evaluation criteria: content, process and presentation. More details and conditions applicable to the degree project are found in the KTH-handbook.

Degree

Students who have successfully completed a two-year Master's programme (120 ECTS) will be awarded a "Teknologic masterexamen", translated into English as "Degree of Master of Science (two years)". The programme has following conditions for the degree:

1. a total of 90 credits of completed courses from the course list
2. courses in the obligatory block must have been successfully completed
3. at least three specialisation courses must be included
4. a degree project of 30 higher education credits.

The local degree policy at KTH is described in detail in the KTH-handbook. www.kth.se/info/kth-handboken/II/19/1.html

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Electrophysics, 120 credits (TELFM),
Programme syllabus for studies starting in autumn 2012

General courses

Year 1

Mandatory courses (28.5 Credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle
EF2200	Plasma Physics	6.0 hp	Second cycle
EI2405	Classical Electrodynamics	7.5 hp	Second cycle
EI2433	Electrotechnical Modelling	7.5 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
AH2923	Global Navigation Satellite Systems (GNSS)	7.5 hp	Second cycle
DN2255	Numerical Solutions of Differential Equations	7.5 hp	Second cycle
ED2200	Energy and Fusion Research	6.0 hp	Second cycle
ED2210	Electromagnetic Processes in Dispersive Media	6.0 hp	Second cycle
ED2246	Project in Fusion Physics	6.0 hp	Second cycle
EF2260	Space Environment and Spacecraft Engineering	6.0 hp	Second cycle
EH2720	Management of Projects	7.5 hp	Second cycle
EI2400	Applied Antenna Theory	7.5 hp	Second cycle
EI2410	Field Theory for Guided Waves	7.5 hp	Second cycle
EI2420	Electromagnetic Wave Propagation	7.5 hp	Second cycle
EI2430	High-voltage Engineering	7.5 hp	Second cycle
EI2440	Electrotechnical Design	7.5 hp	Second cycle
EL2520	Control Theory and Practice, Advanced Course	7.5 hp	Second cycle

IT2651	Microwave Engineering	7.5 hp	Second cycle
SH2008	Introductory Modern Physics	6.0 hp	Second cycle
SI2361	Advanced Mechanics	6.0 hp	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
EK2350	Microsystem Technology	7.5 hp	Second cycle
EL1150	Introductory Matlab Course	1.5 hp	First cycle
EL2620	Nonlinear Control	7.5 hp	Second cycle
EQ1220	Signal Theory	7.5 hp	First cycle
SD1105	Matlab	3.0 hp	First cycle
SG2805	Spacecraft Dynamics	9.0 hp	Second cycle
SH2402	Astrophysics	6.0 hp	Second cycle
SK2400	Quantum Electronics with Electro Optics	12.0 hp	Second cycle

Supplementary information

At least six of the proposed conditionally elective courses should be selected.

Year 2

Conditionally elective courses

Course code	Course name	Credits	Edu. level
DN2274	Computational Electromagnetics	7.5 hp	Second cycle
ED2220	Experimental Fusion Plasma Physics	6.0 hp	Second cycle
ED2230	Chaos and Self-organization	6.0 hp	Second cycle
ED2235	Atomic Physics for Fusion	6.0 hp	Second cycle
ED2240	Introduction Course to Fusion Technology	6.0 hp	Second cycle
EF2215	Plasma Physics II	7.5 hp	Second cycle
EF2225	Project in Space Physics	12.0 hp	Second cycle
EF2226	Project in Plasma Physics	12.0 hp	Second cycle
EF2227	Project in Space Technology	12.0 hp	Second cycle
EF2230	Experimental Techniques in Space Plasma Physics	6.0 hp	Second cycle
EF2240	Space Physics	6.0 hp	Second cycle
EF2245	Space Physics II	7.5 hp	Second cycle
EF2260	Space Environment and Spacecraft Engineering	6.0 hp	Second cycle
EF2270	Applied Plasma Physics	6.0 hp	Second cycle
EH2720	Management of Projects	7.5 hp	Second cycle

EI2402	Electromagnetic compatibility	7.5 hp	Second cycle
EI2410	Field Theory for Guided Waves	7.5 hp	Second cycle
EI2420	Electromagnetic Wave Propagation	7.5 hp	Second cycle
EK2360	Hands-On Microelectromechanical Systems Engineering	7.5 hp	Second cycle
IT2651	Microwave Engineering	7.5 hp	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
ED2250	Publication of Masters Project in Fusion Plasma Physics	7.5 hp	Second cycle
EL2620	Nonlinear Control	7.5 hp	Second cycle
EQ1220	Signal Theory	7.5 hp	First cycle
SD1105	Matlab	3.0 hp	First cycle
SG2805	Spacecraft Dynamics	9.0 hp	Second cycle
SH2402	Astrophysics	6.0 hp	Second cycle
SK2400	Quantum Electronics with Electro Optics	12.0 hp	Second cycle

Supplementary information

At least six of the proposed conditionally elective courses should be selected.



Appendix 2: Specialisations

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This programme has no specialisations.