



Utbildningsplan

Masterprogram, systemkonstruktion på kisel

Master's Programme, System-on-Chip Design, 120 credits

120,0 högskolepoäng

Gäller för antagna till utbildningen fr o m HT08.

Utbildningens mål

For more than 30 years, integrated electronics has been the major new technological force shaping our everyday lives. Today's trend is that of shifting from personal computers to personal communication and computing, where system knowledge and expertise is now being encapsulated into single-chip solutions incorporating both hardware and software. This revolution is enabled and fueled by deep submicron CMOS technologies, through which gigascale integration will be possible in the very near future.

A balanced Master's Programme is offered that includes all the key areas of knowledge and skills required to command the System-on-Chip technology, namely hardware design, embedded software design, analog circuit and radio design, systems engineering and extensive practical project work.

The programme is intended for senior undergraduate and first-year graduate students in electrical engineering and computer science. Key aspects are design methods, architectures and circuit design towards system level integration. The driving forces shaping the content and structure of the programme are:

Internationalisation: The atmosphere on the programme is truly international, with a mix of faculty, course assistants and students from all over the world.

Interdisciplinary approach: Our course mix gives a profound understanding of System-on-Chip design, ranging from deep sub micron and noise issues to formal techniques and system modelling.

Practical competence: Small project assignments and hands-on lab sessions are included in the courses. The knowledge acquired in the courses will be transformed into practical competence in the master's thesis work.

The objectives (learning outcomes of the programme) should be presented according to the national degree ordinance in such a way that references to, or repetition of, the national degree ordinance are not required. The objectives should be structured under the following headings:

Kunskap och förståelse

Upon successful completion of the program the students

- Understand all important components of a System-on-Chip and an embedded system, i.e. digital hardware, analog hardware and embedded software;
- Know the major design flows for digital hardware, analog hardware and embedded software;
- Understand the major architectures and trade-offs concerning performance, cost and power consumption of single chip and embedded systems;
- Has mastered important examples of design languages, tools and techniques in two of these three domains;
- Appreciates the differences and commonalities of these three domains.

Färdigheter och förmågor

Upon successful completion of the program the students are able to

- Design digital hardware;
- Design either embedded software or analog hardware;
- Use important examples of standard design languages and tools;
- Communicate design objectives, plans and results by means of reports and presentations to other SoC and embedded system engineers.

Värderingsförmåga och förhållningssätt

Upon successful completion the students are able

- to critically read technical reports and design documents;
- to assess their strong and weak points;
- to formulate their assessment in concrete and constructive terms.

Utbildningens omfattning och innehåll

The program is a two year, 120 higher education credit education.

The program offers three informal tracks:

- **SoC System & Architecture** track has the main focus on system design, system validation and embedded software;
- **SoC Circuit & Radio** track has the main focus on circuit design, analog mixed signal design and radio communication;

- **SoC Circuit Design & Technology** track has the main focus on circuit design, analog mixed signal design and circuit technology. This track is only given at Fudan University in Shanghai, China.

The instruction language is English in all courses.

Behörighet och urval

*General requirements***1. Previous studies**

A completed Bachelor's degree, equivalent to a Swedish Bachelor's degree (180 higher education credits), from a university recognized by government or accredited by other recognized organisation. A Bachelor's degree in Science or Engineering is required for most programmes (please see the relevant programme description).

Applicants admitted to longer technical study programmes and who have completed courses equivalent to an amount of 180 higher education credits, will be considered on a case-by-case basis.

2. Language requirements

A good knowledge of written and spoken English. Applicants must provide proof of their proficiency in English. KTH accepts a TOEFL test score of a minimum of 550 (213 in the computer-based test, 79 in the internetbased test) or an IELTS score of at least 6.0, no band lower than 5.0 (both general and academic accepted).

English proficiency tests are waived for applicants with English as language of instruction (minimum 3 years of full-time higher education studies).

For EU citizens from KTH's partner universities, a certificate from the University language department or the relevant Head of department stating the student's good level of English is sufficient. Knowledge of English may be taken into account in the selection process.

Specific requirements

Bachelor's degree in Electrical Engineering or Computer Engineering, or an equivalent degree, including a combination of courses equivalent to at least an extent of 60 higher education credits in: Microelectronics, Electronics, Computer engineering, Computer science, Automation and Control, or Communication engineering.

Selection

Students who have met the undergraduate course requirements are evaluated and selected for the program based on their academic record including grades achieved in their courses, their English proficiency test scores, their motivation letter, and their letters of reference. Consideration may also be given for relevant work experience. All other admission requirements and criteria for the programme, including proofs of English proficiency, are in accordance with the local admission policy of the Royal Institute of Technology. See the KTH-handbook 2, section 11.0-11.9 for a full description of these policies.

Utbildningens genomförande

Utbildningens upplägg

The programme is a two year programme; each year consists of four periods. Period 1: September/October for tracks S&A, R&C; October/November for track CTD Period 2: November/December for tracks S&A, R&C; December/January for track CTD Period 3: January/February for tracks S&A, R&C; March/April for track CTD Period 4: March/April/May for tracks S&A, R&C; May/June for track CTD Each course is offered in one specific period. In some cases a course stretched over two consecutive periods. In year 1 many of the courses are obligatory and many are shared between the three tracks. The basic concepts of SoC, embedded systems, and circuit technology are introduced. Year 2 is dominated by specialized courses and design projects. It concludes with a master thesis project.

Kurser

Utbildningen sker i kursform. Kurslistor finns i [bilaga 1](#).

The programme is course-based. Lists of courses are included in appendix 1. A schematic overview of all courses is given in appendix 3. 90 ECTS credits are obligatory and for the remaining 30 ECTS credits there are course with 120 ECTS credits in total to choose from. Appendix 3 also shows which courses are mandatory and elective in the three tracks.

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 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.

Villkor för deltagande i utbildningen

Each student who has been admitted to the master's program is admitted to the compulsory courses belonging to a program term after program term registration. Elective courses are chosen by the student prior to the second term of the first year and prior to each of the two terms of the second year. The choice is limited to the courses stated as elective in the course list. Students who are term registered are considered as expected students in all compulsory courses and in chosen elective courses. Students announce their participation in an individual course to the teacher responsible for the course in the beginning of the course. Students announce possible interruptions in their studies to the teacher responsible for the course. A student is allowed to start the second year of studies, including the master's thesis project, after promotion to the second year. The condition for promotion to the second year is completion of 45 hp in the first year.

Tillgodoräknanden

Brief description of the conditions of receiving credit for previous studies according to the policy of the Royal Institute of Technology. Reference the KTH-handbook policy.

Utlandsstudier

The courses of the first year of the program should be followed at KTH, and the master's thesis project in the second year may be performed at universities or companies abroad.

Examensarbete

In the master thesis project the student shall demonstrate that he/she is able to solve a given design or research problem largely on his/her own with limited guidance from the supervising teacher. In particular the student shall plan how to address the task, assess the difficulties of the individual steps, be able to make a realistic schedule for the project, identify obstacles and problems and suggest changes of the original task or plan if deemed necessary. The student shall demonstrate that he/she is able to find relevant, related work in the literature and to put his/her own work in perspective of other work. If the project includes the design of hardware or software, the student has to be able to demonstrate the correctness of the design. Relevant experiments have to be designed and conducted that allow the drawing of unambiguous and useful conclusions. Finally, the project has to be described in a well structured way in a report and a presentation. The project is graded on a scale from A to F. A-E are passing grades, A is the highest grade. The criteria for grading are, with equal weight, the technical content, the documentation and presentation of the work, and the process of conducting the project. The prerequisite to start the degree project is the successful completion of 60 credits of courses that are mandatory or elective in the chosen track.

Examen

The Master's degree is obtained after completion of the courses and the thesis with a total of at least 120hp. The degree is "Teknologie masterexamen", translated into English as "Degree of Master of Science (two years)". The degree is awarded after application from the student.

[Bilaga 1 - Kurslista](#)

[Bilaga 2 - Inriktningsbeskrivningar](#)



Bilaga 1: Kurslista

Masterprogram, systemkonstruktion på kisel (TSKKM),
Utbildningsplan för kull HT2008

Gemensamma kurser

Årskurs 1

Obligatoriska kurser (30,0 Högskolepoäng)

Kurskod	Kursnamn	Omfattning	Utb. nivå
IL2200	ASIC-design metodik med hårdvarubeskrivande språk	7,5 hp	Avancerad nivå
IL2206	Inbyggda System	7,5 hp	Avancerad nivå
IL2207	Arkitekturer för system på kisel	7,5 hp	Avancerad nivå
IL2217	Digital konstruktion med HDL	7,5 hp	Avancerad nivå

Villkorligt valfria kurser

Kurskod	Kursnamn	Omfattning	Utb. nivå
ID2218	Design of Fault-tolerant Systems	7,5 hp	Avancerad nivå
II2302	Sensor-baserade system	7,5 hp	Avancerad nivå
IL2201	Konstruktion av digitala integrerade kretsar - VLSI	7,5 hp	Avancerad nivå
IL2204	DSP-konstruktion med HDL	7,5 hp	Avancerad nivå
IL2205	Tillämpad signalbehandling	7,5 hp	Avancerad nivå
IL2208	Electronic System Packaging	7,5 hp	Avancerad nivå
IL2209	Avancerad logikkonstruktion	7,5 hp	Avancerad nivå
IL2211	Tillämpningar för system på kisel	7,5 hp	Avancerad nivå
IL2212	Programvara för inbyggda system	7,5 hp	Avancerad nivå
IL2218	Analog elektronik, fortsättningskurs	7,5 hp	Avancerad nivå
IL2219	Radioelektronik	7,5 hp	Avancerad nivå
IL2220	Låg effekts analog och mixed signal IC	7,5 hp	Avancerad nivå
IL2222	Digital design av kretsar i nanoskala för CMOS	7,5 hp	Avancerad nivå
IL2450	Validering på systemnivå	7,5 hp	Avancerad nivå
IS2202	Datorsystemarkitektur	7,5 hp	Avancerad nivå

Årskurs 2

Obligatoriska kurser (22,5 Högskolepoäng)

Kurskod	Kursnamn	Omfattning	Utb. nivå
AK2036	<u>Vetenskapsteori och vetenskaplig metodik med tillämpningar (naturvetenskap)</u>	7,5 hp	Avancerad nivå
EH2720	<u>Projektstyrning</u>	7,5 hp	Avancerad nivå
IL2213	<u>Designprojekt I</u>	7,5 hp	Avancerad nivå

Villkorligt valfria kurser

Kurskod	Kursnamn	Omfattning	Utb. nivå
ID2201	<u>Distribuerade system, grundkurs</u>	7,5 hp	Avancerad nivå
ID2202	<u>Kompilatorer och exekveringsmiljöer</u>	7,5 hp	Avancerad nivå
ID2207	<u>Moderna metoder inom Software Engineering</u>	7,5 hp	Avancerad nivå
II2202	<u>Forskningsmetodik och vetenskapligt skrivande</u>	7,5 hp	Avancerad nivå
II2300	<u>Processer för produktrealisering I</u>	7,5 hp	Avancerad nivå
II2500	<u>Processer för produktrealisering II</u>	7,5 hp	Avancerad nivå
IL2221	<u>Avancerad konstruktion av blandad analog och digital teknik</u>	7,5 hp	Avancerad nivå
IL2452	<u>Språk för system design</u>	7,5 hp	Avancerad nivå
IV2024	<u>Principer för datasäkerhet</u>	7,5 hp	Avancerad nivå



Bilaga 2: Inriktningar

Masterprogram, systemkonstruktion på kisel (TSKKM),
Utbildningsplan för kull HT2008

Programmet har inga inriktningar.