Master’s programme in
**System on Chip Design (SoC)**

For more than 20 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.

**Programme outline**

The programme begins with a mandatory block of courses covering embedded systems, hardware modeling and synthesis and circuit design. Then, one of three specializations is selected:

The Nanoscale CMOS Design of Integrated Circuits track addresses the problem of chip-level design and integration of functional blocks and integrated circuits in nanoscale CMOS technology. It covers the details of circuit design methodology and tools, trade-off analysis between power, area and performance and hardware implementation in silicon technology. It bridges circuit design and nanoscale technologies to architectural strategies and provides understanding of the future development in this field.

The SoC Platforms and Architecture track addresses the problem of designing, assembling, dimensioning and verifying complete SoCs including the embedded software. It covers the details of the digital design flow, the verification of complete SoCs and the hardware dependent software layers.

The Media and Communication Electronics track addresses the problems of SoC application, implementation, and integration at complex system level, with target application in media and communication areas such as digital video broadcasting, multi-media mobile devices, and RFID-based systems. It covers the details of hardware and production realization including design and integration of digital circuits, third-party IP modules, printed circuit board and analog/RF ASICs as system components.

In the second year theoretical knowledge is applied in extensive projects. In a four-month team project a realistic system is designed and verified and best practice project methodology for specification, design, implementation and validation is acquired. Finally, a six-month Master's thesis project brings together all the different, complementary threads of knowledge and skills that have been developed in the programme.
Course overview

Year 1

Term 1
- Digital Design with HDL
- Embedded Systems
- Digital Design for Nanoscale CMOS
- ASIC Design Methodology
- Analog Electronics, Advanced Course
- Advanced Business Opportunities in ICT
- Product Realization Processes I

Term 2
- SoC Architectures
- Design of Digital Integrated Circuits - VLSI
- Design of Fault Tolerant Systems
- Media and Communication Electronics
- Electronic Systems Packaging
- Embedded Software
- System Level Validation
- Sensor Based Systems
- Computer Systems Architecture
- Low Power Analog and Mixed Signal ICs
- Radio Electronics
- ICT Venture Creation
- Global Entrepreneurial Leadership in ICT
- Product Realization Processes II

Year 2

Term 1
- Algorithms for VLSI Design
- Advanced Topics in Mixed Mode Design
- System Design Languages
- RFID Systems
- Design Project Course
- Research Methodology and Scientific Writing

Term 2
- Master's thesis

Master’s thesis

The Master’s thesis project may be carried out at KTH, at other universities, research institutes or at a company in Sweden or abroad. Projects in industry are particularly encouraged.

Career prospects

Former students of the programme have found employment in a great variety of industries, universities and geographic locations. Companies that design and develop electronic components and embedded systems in the telecom, automotive, automation, security, consumer electronics and a variety of other industries are potential employers of former SoC Design students. Due to the international setting of the programme, graduates are well suited to work in global corporations on any continent. A relatively large proportion of graduates have pursued PhD studies as universities in Sweden or abroad.