MSc in System-on-chip

Programme code: TASOC
Scope of the Programme: 120 credits
Cycle: Second
Approved by: Programmes board 1
Validity: 2012/2013
Date of approval: 1 April 2012
In addition to the syllabus, general regulations and information for the Faculty of Engineering apply to this programme.

1 Aim and learning outcomes

1.1 Aim

This internationally oriented Master's programme aims to develop the students' knowledge, skills and judgement in the area of system-on-chip. It is motivated by the dramatic changes taking place in the ASIC and IC fields. Thirty years of circuit design have been dominated by the design of single functions, processor cores, accelerators, etc. Using cutting-edge technology it will be possible to integrate entire systems on one chip. For a number of years, research at Lund University has focused on this problem. Experience gained from this research has been incorporated in the programme of study for the Master of Science in System-on-Chip.

The Master of Science in System-on-Chip aims to
- provide students with sound interdisciplinary skills in the fields of electrical engineering and computer science;
- provide students with specialised knowledge that covers all levels of abstraction from electronic systems to the actual construction of a circuit.
- The programme is characterised by a holistic view of circuit design which gives a qualification which is directly applicable in industry, internationally, nationally and in the region.

1.2 Learning outcomes

The general outcomes for the degree of master are stated in the Higher Education Ordinance (SFS 1993:100). Below is a more detailed formulation of these outcomes.

Knowledge and understanding
On completion of the programme, students shall

- demonstrate specialised knowledge of the foundations in electronics and computer science to the sub-fields relevant to the field of system-on-chip;
- be able to analyse the components from different domains of system-on-chip;
- understand how different domains interact, such as hardware versus software and analogue versus digital construction;
- demonstrate knowledge of intellectual property rights in general and of the field of system-on-chip in particular.

Skills and abilities
On completion of the programme, students shall be able to
- demonstrate the ability to identify, formulate and deal with complex issues in the field of system-on-chip critically, autonomously and creatively and with a holistic approach;
- analyse and critically evaluate different technical solutions in the field of system-on-chip;
- demonstrate the ability to participate in research and development projects in the field of system-on-chip;
- demonstrate the ability to critically and systematically acquire new knowledge in the field of electronics and integrate this with previous knowledge;
- demonstrate the ability to design, simulate and evaluate systems or parts of systems for system-on-chip;
- demonstrate the ability to autonomously plan and complete advanced tasks in the field of system-on-chip;
- demonstrate the ability to develop and design electronic systems and their constituents while taking into account the circumstances and needs of individuals and the targets for sustainable development set by the community; and
- demonstrate the ability to report in speech and writing their knowledge and different types of project work, including background material, investigation and findings, to expert and non-expert audiences in international contexts.

Judgement and approach
On completion of the programme, students shall be able to
- demonstrate the ability to make assessments in the field of system-on-chip informed by relevant disciplinary, social and ethical aspects;
- demonstrate the capacity for teamwork and collaboration with various constellations; and

- demonstrate the ability to identify their need for further knowledge in the field and to continuously upgrade and broaden their knowledge and skills in the field of system-on-chip.

1.3 Further studies

On completion of the second-cycle degree, students have basic eligibility for third-cycle studies.

2 The levels of the programme

The courses on the programme are divided into levels. The level is indicated in the relevant course syllabus. The relevant levels are first cycle (G) and second cycle (A). These levels are defined in the Higher Education Act, Chapter 1 Section 8-9. First-cycle courses at the Faculty of Engineering are further subdivided into First cycle 1 (G1) and First cycle 2 (G2). G2 courses presuppose knowledge acquired on G1 courses.
Second-cycle courses may constitute specialisations in a Master's degree.

3 Programme structure

The programme includes a compulsory block of courses comprising 54 credits and intended to provide an orientation in modern chip design. The aim is to provide a general overview of system-on-chip and a foundation for an understanding of all types of IC design, i.e. in digital, mixed signal and analogue design, and also basic knowledge of built-in systems. An important component, which is also compulsory, is a large IC project of 12 credits.
Several groups will be asked to choose a number of critical components from a system which can be produced in silicon, i.e. sent away for manufacture or implemented in an FPGA and thereafter verified. The projects included can be digital, analogue, mixed signal or for high frequencies, but, above all, the projects aim to achieve a higher level of abstraction, a totality, where the individual projects are part of a complete system-on-chip.

3.1 Courses on the programme

The programme includes a compulsory non-technical course in intellectual property rights. In addition, the student may choose 7.5 credits of other courses not offered within the framework of the programme. The student may also choose to do a major project worth 15 credits, which can be chosen to facilitate work on the degree project. Students may also be allowed to attend PhD courses that fit into the master's programme. In addition to

these courses, students are entitled to accreditation of 7,5 credits of courses in Swedish (organised by Lund University for exchange students).

The courses included in the programme are indicated in the timetable.

3.2 Degree project

For a degree of Master of Science in System-on-Chip the students must complete an independent project (degree project) of no less than 30 credits as part of the course requirements. The degree project must be completed in accordance with the valid course syllabus and must deal with a relevant subject.

4 Grades

Grades are awarded both for entire courses and for course components, when applicable. Course components are indicated in the relevant syllabus. Grades for an entire course are awarded according to a scale of four grades (Fail, 3, 4, 5) or a scale of two grades (Fail, Pass). If another scale of grades is applied, this is indicated in the course syllabus. Only entire passed courses (according to the four-grade scale) are included on the degree certificate. Grades awarded in Swedish higher education are criterion-referenced, i.e. the performances of students are assessed with reference to the relevant learning outcomes and no internal ranking of students is made.

5 Degree

5.1 Degree requirements

For a degree of Master of Science in System-on-Chip students must successfully complete courses comprising 120 credits, including a degree project worth 30 credits. 75 credits must be second-cycle credits, including the degree project.

5.2 Degree and degree certificate

When students have completed all the degree requirements, they are entitled to apply for a degree certificate for a Master of Science (120 credits) in Electronic Design.

6 Specific admission requirements

6.1 Admission requirements

To be admitted to the Master's programme in System-on-Chip, students must have a first degree of 180 credits specialising in electrical engineering or computer science.

In addition to the degree specified above, students must have basic knowledge of digital technology, electronics and computer technology corresponding to no less than 6 months of study. Furthermore, it is recommended that students have specialised knowledge in analogue design and signal processing. Students must also have documented proficiency in English corresponding to at least English B in Swedish upper secondary school.

6.2 Selection

The applicants' grades or equivalent are the main criteria for selection. In addition, the subjects included in the applicants' first degree are considered.

7 Credit transfer

Students are entitled to have previous studies considered for credit transfer, on application. The programmes board decides on credit transfer. When considering credit transfer, the board assesses whether the previous studies correspond to a given course on the programme or whether the previous studies meet the learning outcomes of the programme. A favourable decision will state whether it is the previous course or the course for which credits are transferred that is to be listed on the degree certificate. Credit transfer is not permitted for courses included in the first degree.

8 Transitional provisions

Students currently admitted to the one-year Master of Science programme in System-on-Chip are entitled, on application, to be awarded a degree of 120 credits from the new Master's programme. For the application to be approved, the student must have achieved the applicable degree requirements specified above.

ETI280 Inellectual Property rights is given for the last time and can be replaced with ETIA10 Patent and Intellectual Property Rights.

ETI220 Integrated A/D and D/A Converters is given for the last time and can be replaced with ETIN55 Integrated A/D and D/A Converters.

ETIN01 IC-project and Verification is given for the last time and can be replaced with ETIN35 IC-project and Verification I together with ETIN40 IC-project and Verification II.