

# Master Programme in Wireless Communication

Programme code: TAWIR

Scope: 120 credits

Cycle: Second

Approved by: Educational Programmes Board A

Validity: 2014/2015

Date of approval: 26 May 2014

In addition to the syllabus, general regulations and information for the Faculty of Engineering apply to this programme.

## 1 Aim and outcomes

### 1.1 Aim

This internationally oriented Master's programme aims to develop the students' knowledge, skills and judgement in the area of wireless communication. The increasing importance of telecommunication as a field of technology has been accompanied by considerable and significant recent developments in wireless communication. Systems have become more complex and people working in this field must keep abreast of the latest developments. There is a current and continuing need for qualified people who can deal with both systems and applications.

The Master of Science in Wireless Communication aims to meet the needs for qualified engineers who

- can apply wireless communication technology to the development of new wireless systems;
- can profit by and contribute to research in this field; and
- can apply systems thinking in which theory and practice constitute a whole.
- The programme is characterised by the research into wireless communication carried out at the Faculty of Engineering and by the proximity of research-intensive telecommunications industry in the region.

### 1.2 Outcomes for a Degree of Master of Science (120 credits)

(Higher Education Ordinance 1993:100)

#### Knowledge and understanding

For a Degree of Master of Science (120 credits) the student shall

- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

#### Competence and skills

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- demonstrate the ability in speech and writing both nationally and internationally to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

#### Judgement and approach

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

### 1.3 Specific outcomes for a Degree of Master of Science (120 credits)

#### Knowledge and understanding

For a Degree of Master of Science (120 credits) students shall

- demonstrate in-depth knowledge of the disciplinary foundations of the relevant sub-fields to the field of wireless communication;
- be able to analyse entire systems as well as sub-systems in wireless communication;
- understand how different sub-systems are used and how they interact;
- demonstrate understanding of how research and development work in wireless communication is conducted.

#### Skills and abilities

For a Degree of Master of Science (120 credits) shall be able to

- demonstrate the ability to identify, formulate and deal with complex issues in the field of wireless communication critically, autonomously and creatively and with a holistic approach;
- analyse and critically assess different technical solutions in the field of wireless communication;
- demonstrate the ability to participate in research and development projects in the field of wireless communication;
- demonstrate the ability to critically and systematically acquire new knowledge in the field of wireless communication and integrate this with previous knowledge;
- demonstrate the ability to model, simulate and evaluate systems or parts of systems for wireless communication;
- demonstrate the ability to autonomously plan and complete advanced tasks in the field of wireless communication;
- demonstrate the ability to develop and design radio systems and their constituent parts while taking into account the circumstances and needs of individuals and the targets for sustainable development set by the community; and
- demonstrate the ability in international contexts 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.

#### Judgement and approach

For a Degree of Master of Science (120 credits) 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 and to continuously develop and broaden their knowledge and skills in the field of wireless communication.

## 1.4 Further studies

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

## 2 Programme structure

The programme includes a compulsory block of courses comprising 67.5 credits and intended to provide an orientation in modern wireless communication systems. This block of courses begins with basic courses in digital communications and radio and then continues with systems-oriented courses in wireless communication and specialised courses in a number of sub-fields. The range of courses provides the deep and broad knowledge required for understanding how the sub-systems interact. The programme includes elective courses of no less than 22.5 credits to provide opportunities for specialisation. Students may also be allowed to attend PhD courses that fit into the master's programme and choose other courses comprising 7.5 credits at Lund University not offered within the framework of the programme. The programme is concluded by a degree project worth 30 credits. The compulsory components of the programme comprise a total of 82.5 credits.

### 2.1 Courses

The courses included in the programme are indicated in the timetable. In addition to these courses, students are entitled to accreditation of 15 credits of courses in Swedish (organised by Lund University for exchange students).

### 2.2 Levels

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.

### 2.3 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.

## 3 Specific admission requirements

### 3.1 Admission requirements

A Bachelor in Electrical engineering, Computer Engineering or Information Technology of at least 180 credits including courses in probability theory, signal processing, telecommunication, electromagnetic field theory and circuit theory, corresponding to a combined duration of 6 months. The above Bachelor must also include Mathematics of at least 20 credits. Applicants who do not hold the required degree are eligible provided that they can prove that they are registered for the last semester of a programme leading to such a degree. An official document stating that they are likely to be awarded the degree before the start of the master programme must be submitted. The degree certificate has to be presented before start of the programme. English 6 (advanced).

### 3.2 Selection

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

## 4 Degree

### 4.1 Degree requirements

For a Degree of Master of Science (120 credits) 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.

#### 4.1.1 Degree project

For a Degree of Master of Science (120 credits) 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.

#### 4.1.2 Transitional provisions

ETI031 Radio is given for the last time and can be replaced with ETIF05 Basic Wireless Communication Technique. EIT010 Digital Transmission Engineering is given for the last time and can be replaced with EITN10 Multiplex Antenna Systems.

### 4.2 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). Main Field of Study: Communication Systems.