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## **Translation of Curriculum Statement for Graduate Level (Third-level) Education**

### **Engineering Sciences with specialization in Microsystems Technology**

**Swedish title: Teknisk fysik med inriktning mot Mikrosystemteknik**

TNTEKF09

Swedish Curriculum adopted by the Board of the Faculty of Science and Technology (Board for Third-level Education) on 2008-07-02. Revised on 2020-01-15.

Translation approved on 2010-09-03 and 2020-01-15.

The Curriculum Statement for Third-level Education consists of three parts: a general part, this subject specialized curriculum statement, and each doctoral student's individual study plan.

#### **Objective**

Supervision and thesis work will make the student well prepared to carry out independent scientific research. After the education, the student will be familiar with scientific questions and methods in Microsystems technology, and will have reached thorough knowledge within the specific area of the thesis. The student will be able to critically assess his/her own scientific work and that of others.

The doctoral student shall also be able to present her/his own goals and results orally and in writing to different target groups in English and, in the case of Swedish-speaking doctoral students, in Swedish.

#### **Subject description**

Microsystems Technology (MST) involves the science, engineering and application of structures, components and systems on a micro scale. The smallest details can be of nanometer size, but complex structures and systems can be several millimeters, or even larger when encapsulated. MST is closely related to modern microelectronics, in terms of production methods as well as electronic response and control. The properties of materials used in micro and nano scale are of crucial importance to the function of components and systems. The



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area is very much of a multi-disciplinary nature; with important elements of physics, chemistry, biology, medicine, computer science and many forms of engineering sciences.

MST-based products are used in virtually all societal sectors: energy, industrial manufacturing, transportation, telecom, environmental, control, pharmacy, medical technology, biotechnology, etc. Common components are microsensors and microactuators, microfluidic structures for chemical and medical analysis, and micro-optical elements of different kinds. Sometimes combinations of electrical, mechanical, optical, magnetic, chemical, etc., properties are used in complex multi-functional microsystems.

Information about the research areas that are relevant in the Department can be obtained, for example, by following seminars and lecture series and discussions with teachers in postgraduate training.

## Eligibility

### Basic Eligibility

The basic eligibility for third level education is described in the general part of the curriculum statement.

### Special Eligibility

Special eligibility is assigned to a candidate who has taken courses within all relevant areas in the subject with sufficient breadth and depth. Thus, special eligibility is considered a candidate with one of the following:

- a) has obtained a Master's degree in engineering (Swedish "Civilingenjörsexamen") from a Swedish technical University/College and hence taken courses within the relevant areas of the subject
- b) in a different way has gained knowledge principally to the same extent as in a), irrespectively of the country of study

## Admission

Applicants for third level program in Engineering Science with specialization in Microsystems Technology must submit an application to the head of the Department of Materials Science and Engineering. Admissions to places in third level programs take place normally six times per year.

Upon admission to postgraduate education, the Swedish title of the degree is to be specified in the application. According to decision



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(TEKNAT 2012/215), postgraduate education in Engineering Sciences with specialization in Microsystems Technology shall lead to a *teknologie doktorsexamen*. The English rendering will be a licentiate/doctorate degree of philosophy.

In connection with the admission it must be stated how it is planned to finance both the personal maintenance of the doctoral student, and her/his research.

### Program structure

In connection with the admission, each doctoral student and her/his supervisor shall draw up an individual study plan after consultation with the professor in charge of the third level program. The plan is to be approved by the head of the department (by delegation of the Faculty Board), in connection with the admission.

The individual study plan shall be reviewed jointly by the doctoral student and her/his supervisor, annually, and be provided with a summary of the achieved results and the plans for the coming year. Significant changes and any disagreement on the individual study plan shall be reported to the head of the department or, if deemed necessary, to the Board for Third-level Education.

### Courses

Within the third level program there may be different kinds of courses, such as lectures, literature studies, practical training, field studies, etc. The courses are intended to provide wider insights into the subject as a complement to the specialist skills acquired in the research work. The courses included in the individual study plan can both be separate undergraduate courses and other courses in the MST and other subjects - and then either given as reading assignments or in lecture or seminar series, which are held within or outside the university.

To provide the postgraduate program a clear identity, at least half of the course content in the individual study plan should be of MST profile, and clearly address both micro and systems aspects of the subject. The individual study plan will be dependent on the student's undergraduate profile. If the undergraduate degree is for example in materials technology, or signal processing, or biotechnology, additional undergraduate MST courses are included in curriculum in the aforesaid extent. In addition, graduate courses are selected in order to secure the MST profile and to cover the specific knowledge



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requirements to an extent demanded by the dissertation work, as well as courses of a more general nature.

Postgraduate courses may be selected from courses range from individual research groups or the curriculum of other universities in Sweden or abroad.

The range of courses offered is revised continuously. A minimum of the MST introducing courses offered by Uppsala University at advanced undergraduate level or their equivalents shall be included in the individual study plan if this is not already fulfilled in an earlier exam.

A course in research ethics of at least 2 higher education credits is mandatory for licentiate and doctoral degree. A course in university educational theory is also mandatory for doctoral students who teach at basic and advanced level.

### Requirements for doctoral degree

The requirements for doctoral degree consist of on one hand passed examinations in the courses included in the approved individual study plan of each doctoral student, and on other hand passed public defense of the doctoral thesis. The program leading to the doctoral degree amounts to 240 higher education credits (four years of full-time studies), of which the thesis part amounts to a minimum of 120 higher education credits and the course part to a minimum of 60 higher education credits.

### Requirements for licentiate degree

A stage of at least 120 higher education credits (two years of full-time studies) in the third level program may be completed with a licentiate degree. The requirements for this are that the doctoral student both has passed the examinations included in the program stage and has got an academic paper amounting to a minimum of 60 higher education credits passed. The course part amounts to a minimum of 30 higher education credits.

### Other

Research work in microsystems technology may in many cases with advantage be related to problems that are current in industry or at research institutes and similar organizations.