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

Engineering science with specialization in electronics

Swedish title: Teknisk fysik med inriktning mot elektronik

TNTEKF03

Swedish Curriculum adopted by the Board of the Faculty of Science and Technology (Board for Third-level Education) on 2011-03-09.

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 electronics, 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
Electronics describes the interaction between electric and magnetic fields as well as the motion of charged particles in various media, whereas electronic devices control the movement of charged particles. The subject deals with the study of these phenomena and in particular the various electronic components, circuits and functionalities that can be devised by utilizing the same. The development of methods and processes for the fabrication of such components plays, therefore, a pivotal role. The research is of both theoretical and experimental character and contains both applied and fundamental elements. Research is carried out predominantly within the area of solid state electronics and particularly in the following specific sub-areas:
- Component design and fabrication
- Thin film technology
- Electro-acoustics and sensorics
- Solar cells technology
- Flexible electronics

All sub-areas are of applied character and subsequently the student’s research is often carried out in collaboration with industrial partners. Participation in international projects, EU in particular, is another common form of research.

The research in the area of solid state electronics makes use of a range of advanced process equipment and processes such as ion implantation, CVD, etching, lithography, evaporation and sputtering as well as a number of plasma activated processes. An important part in the education is to give the student substantial experience and skills working with these processes as well as deep understanding about their possibilities and limitations.

**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 considerer to have a candidate with one of the following:

a) has obtained a Masters degree in engineering (Swedish “Civilingenjör”) 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 electronics must submit an application to the head of the Department of Engineering Science. Admissions to places in third level programs take place normally eight times per year.

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 competence acquired in the research work. The courses included in the individual study plan may be chosen from relevant courses given by Uppsala University, other Swedish universities and universities abroad.

Courses that are required for special eligibility may not be counted in as a part of the individual study plan.

The range of courses offered is revised continuously. (A selection of) following courses shall be included in the program:

1. Ångström introductory course for starting PhD students
2. Introductory course for users of the Clean Rom
3. Scientific writing
4. Pedagogical education
5. Physics of semiconductor devices
6. VLSI process technology
7. Vacuum technology
8. Thin film technology
9. Solar cell technology
10. Sensor technology
Depending on the specialization it may be desirable that a non negligible part of the courses of the individual study plan are to be selected from the field of condensed matter physics, and in particular from solid state physics. In the same context materials science is another closely related subject.

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 50 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
It is often advantageous that the thesis work in electronics be related to a specific scientific and/or technological issue of substantial relevance for industry or equally so for research institutes and similar organizations.

Further information can be obtained from the Department of Engineering Sciences, Division of Solid State Electronics, Box 534, 75121 Uppsala.
Website: http://www.teknik.uu.se/fte/