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

Engineering Sciences with specialization in Nanotechnology and Functional Materials

Swedish title: Teknisk fysik med inriktning mot nanoteknologi och funktionella material

TNTEKF15

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 nanotechnology and functional materials, 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
The subject nanotechnology and functional materials comprises the knowledge about how a material's structure on the sub-micron length scale - as well as the electrodynamic processes and interactions taking place on this length scale - affect the macroscopic functionality of the material. The subject encompasses both analysis and synthesis of nanotechnological materials structures. The analysis part mainly focuses on electrodynamic detection principles as well as surface- and
bulk analysis. The synthesis part includes chemical, physical as well as biological manufacturing methods. In Uppsala, the subject nanotechnology and functional materials is strongly connected to applications within pharmaceutics, biotechnology, energy and environmental research. Hence, the materials in focus are polymers, various types of pharmaceutical excipients (solids and gels), drug molecules and other biologically active molecules, as well as solid materials like metals, metal-oxides and other types of ceramics. A strong coupling exists between basic research and advanced technological functions and applications.

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 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 nanotechnology and functional materials 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 (TEKNAT 2012/215), postgraduate education in Engineering Sciences with specialization in Nanotechnology and Functional Materials shall lead to a filosofie doktorsexamen or teknologie doktorsexamen. The English rendering will in either case be a licentiate/doctorate degree of philosophy.
In connection with the admission it must be stated how the personal maintenance of the doctoral student as well as her/his research will be financed.

**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.

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.

In addition to the courses, further studies of specialist literature are generally required in connection to the research work.

**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 40 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 20 higher education credits.

Other
Research within the field of nanotechnology and functional materials almost always involves collaboration across the subject boundaries of physics, materials science, engineering, biology and chemistry. A good ability to cooperate and gather relevant knowledge from other subject fields than one’s own is therefore necessary. Since many of the collaboration partners in the different subject fields are English speaking, it is necessary that the doctoral student can express himself/herself very well in English, verbally and in writing.