Translation of Subject Curriculum (Study Plan) for Third-cycle (PhD) Education

Engineering Sciences with specialisation in Biomedical Engineering

Swedish title: Teknisk fysik med inriktning mot medicinsk teknik

TNTEKF22

Swedish curriculum adopted by the Board of the Faculty of Science and Technology (Third-cycle Educational Board) on 2022-05-04.

The Study Plan for third-cycle studies consists of three parts: a general part, this subject specific study plan, and each doctoral student's individual study plan.

Objective
Building on basic research, the third-cycle studies are expected to provide further insight into the most important areas of the subject as well as in-depth knowledge within at least one subdivision.

The doctoral student should by means of supervision and thesis work be well prepared to pursue research on a scientific sound basis. The doctoral student shall after accomplished third-cycle education be familiar with scientific methods within the subject, reach deep knowledge within the specific research area for the thesis, and broad knowledge within a wider frame related to the thesis, which also may include relevant knowledge of applications in industry and other societal institutions and organizations.

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 engineering physics comprises a broad research field where content emanates from needs of technical solutions in different sectors in society. The subject is interdisciplinary with integration of
physics, but also chemistry, biology and life science. The core of the subject is now well established, but new sub-areas are constantly emerging, e.g. in the biomedical field.

Biomedical Engineering is the interdisciplinary subject that brings together technical research with focus and applications in the medical field, all the way from basic scientific and preclinical research to patient-centered activities. The goal of the research is to increase the quality of life and well-being of people. There is a close connection between basic research and advanced technical applications.

Many of the studies conducted in the field are interdisciplinary, including for example materials science, microsystem technology, mechanics, biology as well as other subjects in the field of biomedical engineering.

Information on which research areas are relevant within the department can be obtained, for example by following seminars and lecture series and through discussions with teachers at the department engaged in postgraduate education. Extensive information about research in biomedical engineering can be found on the website https://www.materialvetenskap.uu.se/biomedical-engineering/

Eligibility

Basic Eligibility
The basic eligibility for third-cycle studies is described in the general part of the study plan.

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-cycle studies in biomedical engineering must
submit an application to the Head of the Department of Department of Materials Science and Engineering. Admission to doctoral studies takes place throughout the year.

Upon admission to postgraduate education, the Swedish title of the degree is to be specified in the application. Postgraduate education in Engineering Sciences with specialisation in Biomedical Engineering shall lead to a filosofie doktorsexamen or, alternatively, a teknologie doktorsexamen. The English rendering will, in both cases, be a licentiate/doktorate degree of philosophy. According to decision (TEKNAT 2012/215) the degree title should be determined by the contents of the postgraduate education and not by the undergraduate degree of the postgraduate student.

At the time of admission, the department must provide a financial assistance plan demonstrating sufficient support to cover the maintenance of the applicant as well as her/his research.

**Program structure**

At the time of admission, each doctoral student and her/his supervisor shall draw up an individual study plan after consultation with the professor in charge of third-cycle studies. The plan is to be approved by the Head of the Department (by delegation of the Faculty Board) at the time of admission.

The individual study plan shall be annually reviewed by the doctoral student and her/his supervisor jointly, and supplemented with a summary of the achieved results and the plans for the coming year. Significant changes as well as any disagreement on the individual study plan shall be reported to the Head of the Department or, if deemed necessary, to the Third-cycle Educational Board.

**Courses**

The third-cycle studies may include different kinds of courses, such as lectures, literature studies, practical training, field studies, etc.

The courses are intended to provide a wider insight into the subject as a complement to the competence acquired during research. The courses included in the individual study plan may be selected from relevant independent courses, mainly at the advanced level and from joint postgraduate courses offered at Uppsala University or at other higher education institutions in Sweden or internationally.
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 order to give the postgraduate education a clear scientific orientation, at least 60% of the course content in the individual study plan should be taken from the natural sciences and/or engineering field, in particular materials science. The doctoral students within the subject are recommended to take courses in scientific writing and an introduction course to doctoral studies and courses in statistics.

**Requirements for doctoral degree**
The requirements for the doctoral degree consist of passed examinations in the courses included in the approved individual study plan of each doctoral student, as well as a passed public defense of the degree project. The studies awarded a doctoral degree comprise 240 higher education credits (four years of full-time studies), of which the doctoral thesis comprises a minimum of 120 higher education credits and the course part a minimum of 50 higher education credits.

**Requirements for licentiate degree**
A doctoral student who has acquired at least 120 higher education credits (two years of full-time studies) is eligible for a licentiate degree. The requirements consist of passing the examinations included in the program stage and receiving a passing grade on an academic paper of at least 60 higher education credits. The part of the course amounts to a minimum of 25 higher education credits.

**Other**
The research education in biomedical engineering is often carried out in international, interdisciplinary research environments, which means that doctoral students in the subject are also trained in good collaboration skills, ability to acquire relevant knowledge from subject areas outside one's own, and strong ability to communicate scientific results to a wider audience.