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

Engineering Sciences with specialization in Tribomaterials

Swedish title: Teknisk fysik med inriktning mot Tribomaterial

TNTEKF11

Swedish Curriculum adopted by the Board of the Faculty of Science and Technology (Board for Third-level Education) on 2008-08-26.
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 tribomaterials 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 tribomaterials includes studies of the friction and wear properties of materials, surfaces and coatings. Specifically, the relation between these properties and the composition, inner structure, mechanical, chemical and thermal properties of the materials.

Nano and micro scale properties are central. The research nature involves a mixture of theory and experiment, with applied as well as fundamental parts. All types of materials are studied: metals, ceramics, biomaterials, polymers, diamond, composites, etc.



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A major part of the activities in Uppsala focuses on preparation and analysis of the tribological properties of thin coatings for tools and components where the functional performance is determined by friction and wear resistance. The highly applied nature of these areas causes the research tasks often to be performed in cooperation with a materials or mechanical industry. An extensive international cooperation exists.

A range of advanced analytical techniques is employed, e.g. transmission and scanning electron microscopy and their associate analytical techniques. A very important part of the education aims towards giving a good foundation in these techniques, and knowledge of 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 considered 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 tribomaterials 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 Tribomaterials shall lead to a



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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 competence acquired in the research work. The courses included in the individual study plan may partly be selected from basic courses such as: Tribology, Deformation mechanisms, Ceramic materials, Tribomaterials, Microscopy and microanalysis, Metals and alloys, Polymers, Tribological surfaces.

Special courses may have a direct focus towards the thesis work or be of a more general nature. Examples of specialised courses include: Picture analysis, Materials theory, Thin film technology, Nano structured materials, Corrosion and surface chemistry, Metal cutting and forming.

Other courses may include:

Materials selection, FEM techniques, Project management, Test planning, Entrepreneurial techniques, etc.

A course in research ethics of at least 2 higher education credits is mandatory for licentiate and doctoral degree. A course in university



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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 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

Research within Engineering science with specialization in Tribomaterials almost always involves cooperation between research subject, and also with industrial partners. Good skills in cooperation and skills in acquire relevant knowledge about other subjects is therefore necessary. The industrial and technical relevance also requires good ability in communicating scientific results in an efficient way with people outside academia.