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

Engineering science with specialization in industrial engineering and management

Swedish title: Teknisk fysik med inriktning mot industriell teknik

TNTEKF19

Swedish Curriculum adopted by the Board of the Faculty of Science and Technology (Board for Third-level Education) on 2012-01-23. Translation approved 2012-01-23.

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
Through supervision and thesis work the students shall be prepared to independently pursue research on a sound scientific base. The student shall after completed education be well informed with scientific methods within the subject area, have achieved a deep knowledge within the specific thesis area and have broad knowledge of an adjoining area. This may also include relevant knowledge of practical applications in industry and society in general.

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 research subject of Industrial Engineering & Management covers the study of how technology is developed, creates value and diffuses in the late modern industrial society. One central point of departure are how those processes - where technical solutions find their form and areas of application – are highly influenced by economic as well as political and cultural aspects of society. Research as well as education is therefore guided by a special interest in how those transformational processes that defines innovations unfold and
become organized by heterogeneous factors and mechanism of technical, economical and social nature.

The subject area thus covers a broad cross-disciplinary field that aims to understand technology in context – and from it also the prerequisites for technical development. With point of departure in different needs of technical solutions the research is characterized predominantly by longitudinal approaches (for instance process oriented or historical studies of development) that aim for a holistic perspective in order to understand the development and utilization of technical applications within different sectors of society.

The subject area spans several subfields; from areas of social science such as industrial management & organization, and innovation & entrepreneurship to more technical oriented areas such as production technology and machine construction.

**Industrial management & Organization** focuses on managerial and organizational problems that are characteristic in technology- and knowledge intensive environments. A central theme is the cross-functional interplay between technical, economic and social/organizational interests within technology intensive areas. (Such as for example energy production, life sciences but also within traditional manufacturing and process industry.)

**Innovation & Entrepreneurship** deals with the process of innovation from concept to realization of products and services from a technical as well as economic and social perspective. A central theme is the cross-functional interplay between technical, economic and social/organizational challenges during the process of development, from idea to commercialization. Business developments in order to create value for clients and to create new markets for new technologies are also central themes. Within this subfield there is a particular interest in how academic research becomes utilized in society – usually referred to as academic entrepreneurship.

**Production technology** is a technical sub area with cross-disciplinary elements. The research deals with the development of technical components and systems and is particularly focused on development and (technical) management of complex production systems. Of particular interest is how to maintain, run and develop such systems with regard to flexibility, robustness and performance. Topics concerning automation do also belong to the research sub area.
Machine construction is a technical sub area that covers methods and techniques for development, construction and analysis of technical applications, systems and components. Sub areas are among others: system development, methodology for construction, product modulation and simulation, construction optimization, construction automation with CAD.

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, a person has special eligibility if she/he:

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

Admission
Applicants to the third level program in Engineering science with specialization in industrial engineering and management must submit an application to the head of the Department of engineering science. Admissions to places in third level programs take place normally six 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 insight into the subject as a complement to the specialist competence acquired in the research work. The courses should also support the research work by providing skills in methodology, written and oral presentation. Third level students that participate in the teaching at the undergraduate level should pass courses in university didactics, if not corresponding knowledge has been acquired elsewhere.

Courses in Theory of science (10 higher education credits), in Scientific method (10 higher education credits) and in research ethics (2 higher education credits) are mandatory at both licentiate and doctoral level. Additional courses depends on the nature of the research project and are to be decided upon, in collaboration with tutoring professor, in the individual research plan. Examples of such courses may be Innovation Management, Temporary organization, Decision Theory, and Social/Business Network Analysis.

Students are also advised to take courses in scientific writing and introduction to graduate research.

All courses should be on graduate level. Some courses on basic and advanced level that are significant for the doctorand training may after approval of tutoring professor be counted into the doctoral exam. Such exceptions should be done very restrictively and may not include courses that previously have been taken and on which the decision of admittance has been based.

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 the 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
Some participation in undergraduate teaching within the subject Industrial engineering and management may be part of the employment, e.g. as teaching or laboratory assistant. These tasks should not exceed 20 % of the total time, and should not restrict the effective research time (four years of full-time study) on the doctoral level.

Research in Industrial engineering and management largely relies on cross-disciplinary collaboration. It is therefore necessary that the third level student has good collaboration skills and ability to retrieve relevant knowledge from other disciplines. The position also requires good communication skills, both in writing and orally.