



GENERAL CURRICULUM FOR EDUCATION AT RESEARCH LEVEL IN MECHANICAL ENGINEERING

2007-10-25

1 Subject field

In the subject Mechanical Engineering at BTH *sustainable product innovation* provides a uniting and comprehensive aim and direction. The concept of *sustainable* comprises economic, social and ecological dimensions. *Product* refers to physical artefact, software, processes, services or combinations of these in systems (often called product-service-system). The concept of *innovation* comprises the full product development and realisation process. Problems comprehended by this comprehensive aim and direction are approached from different perspectives and specialization takes place in different sub-areas. Examples of perspectives and sub-areas are *strategic sustainable development, methodology for sustainable product development, simulation-driven design* and different *special disciplines in mechanical engineering* with relevance for the comprehensive aim and direction. By way of example, the studies deal with how to integrate sustainability aspects in methodology for strategic planning, policy formulation, needs identification, criteria formulation, idea and concept generation, prioritization, and internal and external communication at product innovation. And this in its turn requires methods and tools which render it possible for product developers to efficiently and at the earliest stage possible foresee, describe, assess, and improve product qualities. Simulation is required both for the prediction of technical product qualities as function of different combinations of design variables and for the prediction of economic and socio-ecological consequences of the product life cycle. Coordination and linkage of these simulation perspectives is a pressing matter. An overall goal is to be able to integrate all the relevant methods and tools for sustainable product innovation in business leaders' and product developers' regular computerized work environment. Advanced IT facilities for e.g. modeling, simulation, visualization, optimization, product data management and distributed engineering work are characteristic of the research. Examples of special areas that presently are being studied and used for product improvements are *complex mechanical and mechatronic systems, structural dynamics, fluid dynamics, non-destructive materials testing* and *fracture mechanics*.

2 Outline of the education

The education at research level in Mechanical Engineering which is concluded by a licentiate's degree comprises a net time period of study of two years (120 credits) and consists of courses that together award 40-60 credits and a dissertation that awards 60-80 credits.

An education at research level in Mechanical Engineering which is concluded by a doctor's degree comprises a net time period of studies of four years (240 credits) and consists of



courses that together award 70-90 credits and a dissertation of 150-170 credits. The distribution of credits will be evident from the individual study plan.

The education also includes active participation in research meetings and seminars at the department. The research student will on these occasions on the one hand present her/his results and on the other hand act as an opponent. The research student should also participate in international conferences in the subject field. It is recommended that the research student spends some time at a foreign seat of learning or research institute. The research student should, if possible, and above all during the later part of the education, contribute to the acquisition of research funds.

3 Eligibility and selection

3.1 Basic eligibility

According to the Swedish Higher Education Ordinance, Chap 7, 39 § ([Admission rules for educations at Blekinge Institute of Technology](#) refers to the Swedish Higher Education Ordinance).

3.2 Selection

According to [the Swedish Higher Education Ordinance, Chap 7, 41 §](#) and local guiding principles in the [Admission rules for educations at Blekinge Institute of Technology](#).

The basis for selection among the eligible applicants is the degree of capacity for profiting by the research education, together with the accessibility to supervision and other resources as regards the planned direction of the dissertation.

Admission to the research education takes place continuously.

4 Examinations that form part of the education

The education consists of courses and a scientific study. Examinations which form part of the education at research level are assessed with the grade pass/fail. Course grades respective the licentiate's dissertation grade are determined by a specially appointed [examiner](#). The doctor's dissertation grade is determined by a specially appointed [examination committee](#).

4.1 Courses

The main purpose with the course part is for it to provide support for the dissertation work and also to enable that the above mentioned goals of the research education in other respects are reached. Consequently, the greater part of the courses will be advanced courses in the subject field. The teaching in this type of courses is mostly done in the form of supervised individual studies and seminars.

Courses or course parts from the undergraduate programme may also be included if the research student needs to supplement her/his previous knowledge.



General courses in, for example, theory of science, research methodology, information retrieval, presentation techniques, leadership and technical English should be included to an extent of approximately 15 credits. The research student is encouraged to take courses also at other seats of learning, nationally and internationally. The choice of courses should be characterized by flexibility as regards the research student's previous knowledge and also the direction of the dissertation work and will be determined in consultation between the research student, the supervisor(s) and the examiner. The examination form is determined by the examiner in consultation with the supervisor.

4.2 Scientific work

The scientific study in the form of a dissertation in Mechanical Engineering will be designed as an integrated, coherent scientific study (monograph) or as a summary – a comprehensive summary – of scientific articles (compilation dissertation), which the research student has composed alone or jointly with another person.

The licentiate's dissertation will be defended orally at a public licentiate seminar. For additional information, please see the [Regulations for licentiate seminars](#) determined by the Faculty Board.

The doctor's dissertation will be defended orally at a public disputation. For additional information, please see the [Regulations for disputations](#) determined by the Faculty Board

5 Degree

In Mechanical Engineering the research student admitted to a doctor's degree has the possibility to pass a licentiate's degree after completion of a minimum of 120 credits of the education that is to be concluded by a doctor's degree.

5.1 Degree objectives

Objectives according to [degree description](#) (the Higher Education Ordinance, Appendix 2 – Examination rules), also see appendix.

5.2 Degree denomination

The research student who passes a licentiate's degree in Mechanical Engineering will receive the degree of Licentiate of Engineering.

The research student who passes a doctor's degree in Mechanical Engineering will receive the degree of Doctor of Engineering.

6 Entry-into-force and transitional provisions

Earlier general study plans cease to apply for research students who are admitted to education at research level after 2007-07-01 in accordance with SFS [Swedish Code of Statutes] 2006:1053. Research students who have been admitted before this date may, until the end of June 2015, choose to either follow the earlier effective study plan or pass to the present one.



APPENDIX

Objectives for the education at research level (the Degree Ordinance, [the Higher Education Ordinance appendix 2](#)):

1 Knowledge and understanding

For a degree of Licentiate 120 credits the doctoral candidate must

- demonstrate knowledge and understanding in the field of research, including current specialist knowledge in a defined part of the field and a deeper knowledge of scientific methods in general and of methods in the specific field of research in particular.

For a degree of Doctor 240 credits the doctoral candidate must

- demonstrate broad knowledge in and a systematic understanding of the field of research, together with deep and up-to-date specialist knowledge in a defined part of the field of research, and
- demonstrate familiarity with scholarly methods in general and with methods in the specific field of research in particular.

2 Skills and abilities

For a degree of Licentiate 120 credits the doctoral candidate must

- demonstrate an ability to identify and formulate issues, critically, independently and creatively, and proceeding with scientific precision; to plan a limited research project and other advanced tasks and to carry them out using appropriate methods within specified time limits, so as to contribute to the development of knowledge; and to evaluate this work;
- demonstrate an ability to clearly present and discuss research and research results in dialogue with the scholarly community and society in general, orally and in writing, in both national and international contexts; and
- demonstrate the skills required to independently participate in research and development work and to work independently in other advanced contexts.

For a degree of Doctor 240 credits the doctoral candidate must

- demonstrate an ability to engage in scholarly analysis and synthesis and in independent, critical examination and assessment of new and complex phenomena, issues and situations;
- demonstrate an ability to identify and formulate issues, critically, independently and creatively, and proceeding with scientific precision, and to plan and, using appropriate methods, conduct research and other advanced tasks within specified time limits, and to scrutinize and evaluate such work;
- demonstrate, in a dissertation, her/his ability to make a substantial contribution to the development of knowledge by her/his own research;
- demonstrate an ability to present and discuss research and research results with authority, in dialogue with the scholarly community and society in general, orally and in writing, in both national and international contexts;
- demonstrate an ability to identify the need of further knowledge, and



- demonstrate a potential to contribute to the development of society and support other people's learning, both in the field of research and education and in other advanced professional contexts.

3 Judgement and approach

For a degree of Licentiate 120 credits the doctoral candidate must

- demonstrate an ability to make ethical assessments in her/his own research,
- demonstrate insight into the possibilities and limitations of science, its role in society and people's responsibility for how it is used; and
- demonstrate an ability to identify her/his need of further knowledge and to take responsibility for developing her/his knowledge.

For a degree of Doctor 240 credits the doctoral candidate must

- demonstrate intellectual independence and scholarly integrity and an ability to make ethical assessments relating to research; and
- demonstrate deeper insight into the potential and limitations of scholarship, its role in society and people's responsibility for how it is used.

4 Scholarly essay

For a degree of Licentiate 120 credits the doctoral candidate must

- have received a passing grade on a scholarly essay (licentiate's dissertation) worth at least 60 credits.

For a degree of Doctor 240 credits the doctoral candidate must

- have received a passing grade on a scholarly dissertation (doctoral dissertation) worth at least 120 credits.