



General syllabus for third-cycle courses and study programmes for the third-cycle subject area Mechanical Engineering (*Maskinteknik*)

1 Description of the third-cycle subject area at BTH

In the subject area Mechanical Engineering at BTH product development capability for innovation in a sustainable society is an overall direction. The concept of *sustainable* includes economic, social and ecological dimensions. *Product* refers to physical artefacts, software, processes, services or combinations thereof, in systems, so called product-service systems. The concept of *innovation* includes a focus on value creation in the product development process, where the whole and view of the life cycle, down to details or materials of individual products are included.

Problems within the overall direction is attacked from different perspectives and focus is made in different areas. Examples of perspectives are *methodologies for product development*, *simulation-driven product development*, and *model-based product development* which requires methods and tools that enable product developers too efficiently and in as early stages possible predict, describe, assess and improve product characteristics.

Design-, development-, analysis-, modelling- and simulation- methodology are needed for the prediction of technical product features as a function of different combinations of design variables of the product life cycle.

Broad or specialized engineering skills in a majority of disciplines, together with modelling and simulation are needed for the prediction of technical product properties as a function of different combinations of design variables as well as for the prediction of economic and socio-ecological consequences over the products life cycle. An overall goal is that when needed be able to integrate all relevant methods and tools for product development capability in the everyday working environment of business leaders and product developers.

Advanced IT tools, for example analysis, modelling, simulation, visualization, optimization, product data management and distributed engineering linked to experimental methods is characteristic of the research. Examples of special areas currently being studied and used for product improvements are value-driven development models, innovation engineering, model driven and simulation driven development, mechanical and mechatronic systems, structural dynamics, and fracture mechanics.

2 Structure of the course/programme

Third-cycle courses and study programmes which finish with a Degree of Licentiate comprise an actual period of study of two years (120 higher education credits) and consist of a course



component of minimum 40 higher education credits and a licentiate thesis of minimum 60 higher education credits.

Third-cycle courses and study programmes which finish with a Degree of Doctor comprise an actual period of study of four years (240 higher education credits) and consist of a course component of minimum 60 higher education credits and a dissertation of minimum 150 higher education credits.

A third-cycle student who is admitted to the Degree of Doctor is given the possibility to take a Degree of Licentiate (according to the above) after having completed minimum 120 higher education credits of the programme that is to be finished with a Degree of Doctor.

For each third-cycle student an individual study plan is set up. The individual study plan describes the individual set-up of the studies. The individual study plan is revised and followed up yearly in accordance with the routines that are established at BTH. The study plan is to show in a convincing way how the goals for the third-cycle student's studies can be attained within the available time period.

In accordance with the Higher Education Ordinance at least two supervisors are appointed for each third-cycle student of whom one is appointed principal supervisor. For examination and grading in the third-cycle education, the Higher Education Ordinance also requires that an examiner is appointed for each third-cycle student. The supervisors and the examiner will be appointed according to BTH's guidelines. A supervisor, who is not the principal supervisor of the two, must have a doctoral degree. In addition, further supervisors may be affiliated to the third-cycle student, e.g., from the business sector, if this is for the benefit of the third-cycle student's studies. For these additional supervisors there is no demand on having a doctoral degree.

2.1 Purpose of the education

BTH conducts third-cycle education in order to contribute with solutions to the complex challenges in society and to meet the demands of a changeable labour market.

Specifically, the third-cycle courses and study programmes aim at developing the third-cycle student's knowledge in the subject area and her/his capacity to independently carry on research-, development-, teaching- and investigatory work based on a scientific foundation in different areas of society. The purpose of the Degree of Doctor is, in addition, to give the third-cycle student the capacity to critically and independently plan, initiate, and lead such work.

2.2 Goals for the education

According to the System of Qualifications in the Higher Education Ordinance (1993:100) according to enclosure.

2.3 Realization of the education

The third-cycle student carries on research and writes a scientific work (licentiate thesis/doctoral dissertation). In support of this, the education may include lectures, seminars, literature studies, project assignments, group supervision and individual supervision. Courses



for each third-cycle student are established individually in consultation with the supervisors and the examiner and are entered into the individual study plan.

The supervision of the education aims at assisting the third-cycle student regarding choice of research domain, scientific method and organization and planning of the scientific work and pertaining studies. The supervisors are to assist with subject competence and see to that the work holds an international quality level. Furthermore, the supervision aims at introducing the third-cycle student to the scientific community and its demands on ethics, honesty and critical thinking.

The third-cycle student is to participate in national and international contexts and present her/his own research.

During the education period the third-cycle student is to take part of the scientific activities which are conducted in the scientific environment at the department/faculty by attending seminars and guest lectures, and, in the normal case, give one seminar per year about her/his thesis work.

The third-cycle student is to carry out a popular science-based presentation of her/his research before the Degree of Licentiate and public defense of the doctoral dissertation and write a popular science-based summary which is to be included in the licentiate thesis respective the doctoral dissertation.

A third-cycle student, employed by the higher education institution as a doctoral student, is recommended to dedicate certain time (not more than 20 per cent of full working hours) to teaching in first- and second-cycle courses and programmes. Such work is financed by the first- and second-cycle courses and programmes and is to be accounted for in the individual study plan.

The education should be organized so that the third-cycle student attains the stipulated examination targets. How the knowledge needs of each individual third-cycle student are to be fulfilled in order to attain the examination targets is stated in respective individual study plan.

3 Entry requirements and selection

3.1 General entry requirements

According to 7 Chap. 39 § in the Higher Education Ordinance (1993:100).

3.2 Specific entry requirements

Qualified for entry to third-cycle education is she/he who has taken a second-cycle qualification in the fields of engineering or mathematics-sciences or who in some other way has acquired knowledge to be able to profit by the third-cycle studies of the subject.

3.3 Selection

According to 7 Chap. 41 § in the Higher Education Ordinance (1993:100) and the current admission regulations at BTH. Selection is to be made in consideration of the applicants'



capacity to profit by the education. The foundation for selection among the qualified applicants is the degree of capacity to profit by the third-cycle education, and the access to supervision and other resources in view of the planned specialization of the licentiate thesis/doctoral dissertation.

The bases of assessment applied at the selection for third-cycle education are constituted by:

- Familiarity with the theory and applications of the subject,
- Relevant work experience where appropriate,
- Skills in expression of speech and in writing,
- Familiarity with English,
- Creativity, capacity for initiative, independence and ability to co-operate.

To assess how the applicant fulfills the bases of assessment results are used that show passed higher education courses, quality of the independent work and possible publications, references, interviews together with a personal letter from the applicant which describes the applicant's expectations on and intentions with the education. In certain cases the applicant may undergo specific work tests.

Admission to third-cycle education is done on a continuous basis.

4 Examinations that form part of the education

The education consists of courses and a scientific work. Examinations that form part of the third-cycle education are assessed with the grades pass/failed. A grade on a course and a licentiate thesis, respectively, is determined by a specially appointed examiner. A grade on a doctoral dissertation is determined by a specially appointed grading committee.

For a possible credit transfer, see the current order for credit transfers and the guidelines for credit transfers for first-cycle and second-cycle education.

4.1 Courses

In support of the research work and for the fulfilment of the examination targets generally, the third-cycle student takes a number of courses. Courses completed at BTH as well as courses from other higher education institutions can be included.

For third-cycle courses given at BTH there is to be a written course description which, among other things, states the title of the course in Swedish and English, the course objectives, content and credits. The individual study plan is to regulate which courses can form part of the studies and how many higher education credits each course should award (for participation in a course originally intended for first- or second-cycle see the guidelines for credit transfer of courses in third-cycle education).

Components of the education in the areas below are compulsory. How these are examined, through a course or other component, is regulated in each separate individual study plan.

- Research methodology
- Information search for researchers



- Scientific writing and scientific review
- Ethics in research

The choice of courses is to be characterized by flexibility with regard to the third-cycle student's prior knowledge and the specialization of the research work and is to be determined in consultation between the third-cycle student, supervisors and examiner. The examination format is determined by the examiner in consultation with the supervisors. Goal attainment is tested by the examiner.

All compulsory courses or components are to be completed before the doctoral dissertation is publicly defended at the public defence of the doctoral dissertation. Other courses and components are to be chosen so that the third-cycle student obtains both breadth and depth in the research domain. The courses are also to benefit the third-cycle student's competence and skills, her/his studies or scientific work.

4.2 Scientific work

Scientific work in the form of a licentiate thesis/doctoral dissertation is to be designed as an integrated, connected scientific work (monograph) or as a summary – introductory chapter – together with pertaining scientific academic papers (compilation), which the third-cycle student has written alone or together with another person. The scientific work is written in English or Swedish.

The licentiate thesis is to be defended orally at a public licentiate seminar. For further information please see "Regulations for licentiate seminars" established by BTH.

The doctoral dissertation is to be defended orally at a public defence of doctoral dissertation. The thesis must have previously been quality assured as described in "Appendix – Pre-evaluation of doctoral thesis in the subject Mechanical Engineering". For further information please see "Regulations for the public defence of a doctoral dissertation" established by BTH.

5 Degree

5.1 Examination targets

Goals according to the System of Qualifications in the Higher Education Ordinance (1993:100) according to enclosure.

5.2 Title of qualification

The degree title of third-cycle studies in Swedish at BTH consists of a general degree with the addition of a prefix. The prefix is normally teknologie (Technology).

Third-cycle students studying for a Degree of Licentiate in Mechanical Engineering normally receives the Swedish degree title teknologie licentiatexamen (Eng. Degree of Licentiate of Technology).

Third-cycle students studying for a Degree of Doctor in Mechanical Engineering normally receives the Swedish degree title teknologie doktorsexamen (Eng. Degree of Doctor of



Philosophy).

Exceptions to the prefix Technology in the Swedish degree: For individuals who do not have a second-cycle technical education¹ a degree of Philosophy will be awarded. The prefix should be clarified in the individual study plan. For a degree of Philosophy the Swedish degree title is:

Filosofie licentiatexamen (Eng. Degree of Licentiate of Philosophy).

Filosofie doktorsexamen (Eng. Degree of Doctor of Philosophy).

6 Effective date and interim regulations

This general syllabus becomes effective on June 1, 2021.

Third-cycle students admitted before June 1, 2021, will complete, as a general rule, their studies according to the older general syllabus. If a third-cycle student so requests and it is deemed suitable, the relevant examiner may accept a transfer to the new general syllabus. The third-cycle student will then report the transfer to the relevant Dean and attach a copy of an updated individual study plan updated according to the new general syllabus.

¹ A technical education refers to a Master's degree in Engineering, Master's degree in Science or equivalent in a technical or mathematical-scientific field.



Appendix – Pre-evaluation assessment of a doctoral thesis in the doctoral subject Mechanical Engineering

1. Introduction

The pre-evaluation process described in this document concerns doctoral degrees that are part of the doctoral programme at Blekinge Institute of Technology in the field of mechanical engineering.

The main objective of the pre-evaluation process is for external examiners to individually assess whether a doctoral thesis is of such quality that it can be submitted and defended in a public defence.

It is important to stress that the opinions of external reviewers are only advisory and do not bind them to make a particular decision in the defence itself.

Before the pre-evaluation begins, the doctoral student must have completed the seminar according to the procedures for the doctoral programme in mechanical engineering².

2. External reviewers

The external reviewers who will evaluate the doctoral thesis are the senior researchers who are planned to be part of the grading committee at the public defence. If a planned grading committee is to include three (3) senior researchers, everyone should conduct individual evaluations using the form in Appendix 1 of this document. Thus, the formal requirements for who can be a reviewer before the evaluation are the same as those who prescribe who may be a member of a grading board at the public defence at Blekinge Institute of Technology.

3. Pre-evaluation format

The form of the pre-evaluation shall follow the pre-evaluation assessment form. The form shall be completed by each of the reviewers prior to the evaluation and they shall submit the review forms before the deadline set out in the next subsection.

4. Deadline for pre-evaluation

The completed pre-evaluation form must be sent to the doctoral student's main supervisor at least two (2) months before the planned public defence.

5. Pre-evaluation process

The following is a description of the sequential process for collecting the pre-evaluations from the reviewers. The roles in this process are the doctoral student's main supervisor, the reviewers in the pre-evaluation and the Dean of the Faculty of Engineering at BTH.

- It is the main supervisor's responsibility to send the pre-evaluation form to each of the reviewers, i.e. the senior researchers to be included in the grading committee. The examiner shall be given at least two (2) weeks to assess the preliminary doctoral thesis, publications, etc. and then submit the review form before the deadline above.

² https://share.mindmanager.com/?mm_link_external=true#publish/qTm7ukMW3hJ04b6CpwtFmyg2BSXzZs6_59E4wOXT



- Each reviewer evaluates the preliminary doctoral thesis, publications, etc. and then fills out the review form according to the instructions in the form. After that, the forms must be signed and sent back to the main supervisor.
- The main supervisor collects and stores each of the forms received.
- If all pre-evaluation forms are positive, the planned doctoral defense will continue according to plan. The main supervisor should attach the pre-evaluation review forms to the application form when applying to arrange the public defence. If one (or more) of the evaluation reviews turns out to be negative, the main supervisor informs the Dean as well as the doctoral student and the other supervisors in good time.



Form for the pre-evaluation of a doctoral thesis in the doctoral subject Mechanical Engineering at BTH

Use this form to inform Blekinge Institute of Technology if you believe that the doctoral thesis is of such quality that it can be submitted and defended in a public defence. It is important to note that the opinion is only advisory and does not bind you to make a certain decision at the actual public defence. A positive opinion need not be followed by any reasoning or comments. However, a negative opinion should be followed by a brief reasoning. If you summarize your considerations in written format below, remember that it is a public document.

Doctoral student's name
Name:

Preliminary title of the doctoral thesis
Title:

Pre-evaluation of the doctoral thesis
<input type="checkbox"/> I believe that the thesis is of such quality that it can be presented in a public defence.
<input type="checkbox"/> I do <u>not</u> believe that the thesis is of such quality that it can be presented in a public defence.
<i>If you <u>do not</u> consider the thesis to be of such quality that it can be presented <i>and defended</i> in a public defense, summarize your considerations below.</i>
Comment:

Signature	
Name:	
Date:	Signature:



ANNEX - General qualifications

Degree of Licentiate [Licentiatexamen]

Scope

A Degree of Licentiate is awarded

either after a third-cycle student has completed a study programme of at least 120 credits in a subject in which third-cycle teaching is offered,

or after a third-cycle student has completed one part comprising at least 120 credits of a study programme intended to conclude with the award of a PhD, if a higher education institution decides that a Degree of Licentiate of this kind may be awarded at the institution.

Outcomes

Knowledge and understanding

For a Degree of Licentiate the third-cycle student shall demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For a Degree of Licentiate the third-cycle student shall

- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work
- demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general, and
- demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.

Judgement and approach

For a Degree of Licentiate the third-cycle student shall

- demonstrate the ability to make assessments of ethical aspects of his or her own research
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and



- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Thesis

For a Degree of Licentiate the third-cycle student shall have been awarded a pass grade for a research thesis of at least 60 credits.

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Licentiate with a defined specialisation.

Degree of Doctor

Scope

A Degree of Doctor is awarded after the third-cycle student has completed a study programme of 240 credits in a subject in which third-cycle teaching is offered.

Outcomes

Knowledge and understanding

For the Degree of Doctor the third-cycle student shall

- demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For the Degree of Doctor the third-cycle student shall

- demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically
- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work
- demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research



- demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general
- demonstrate the ability to identify the need for further knowledge and
- demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.

Judgement and approach

For the Degree of Doctor the third-cycle student shall

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics, and
- demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.

Research thesis (doctoral thesis)

For the Degree of Doctor the third-cycle student shall have been awarded a pass grade for a research thesis (doctoral thesis) of at least 120 credits.

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Doctor with a defined specialisation.