



# General syllabus for third-cycle studies in the third-cycle subject area of Mechanical Engineering

**Decided by:** The deans jointly.

**Effective from:** 2024-01-01

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**Note:** This is a translation of the established Swedish-language version of the General Syllabus in the subject. In the event of discrepancies, the Swedish-language version takes precedence.

## **1 Description of the third-cycle subject at BTH**

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

Problems within this overall focus are approached from different perspectives and deepened in different sub-areas. Examples of perspective areas are methodologies for product development, simulation-driven product development, and model-based product development, which require methods and tools that enable product developers to effectively and at the earliest possible stages can predict, describe, assess and improve product properties. Design, development, analysis, modelling and simulation methodology is needed for prediction of technical product properties as a function of different combinations of design variables over the product life cycle.

Broad or specialized engineering knowledge in a variety of disciplines, together with modeling and simulation is needed for prediction of technical product properties as a function of different combinations of design variables as well as for prediction of economic and socio-ecological consequences over the product life cycle. An overall goal is to be able to integrate all relevant methods and tools for product development capabilities into the regular work environment of business leaders and product developers.

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

## **2 Structure of the programme**

Doctoral studies that end with a licentiate degree comprise two years of net study time (120 credits) and consist of a course component of at least 40 credits and a licentiate thesis of at least 60 credits.

Doctoral studies that end with a doctoral degree comprise four years of net study time (240 credits) and consist of a course component of at least 60 credits and a thesis of at least 150 credits.

Doctoral students who have been admitted to a doctoral degree are given the opportunity to obtain a licentiate degree (as above) after a part of at least 120 credits has been completed of the education that is to conclude with a doctoral degree.

An individual study plan is drawn up for each doctoral student<sup>1</sup>. The individual study plan describes the individual structure of the education. The individual study plan is revised and followed up annually in accordance with the routines established at BTH. The study plan should convincingly demonstrate how the objectives of the doctoral student's doctoral education can be achieved within the available time.

In accordance with the Higher Education Ordinance, at least two supervisors are appointed, one of whom is appointed as principal supervisor. According to the Higher Education Ordinance, an examiner must also be appointed for each doctoral student for assessment and grading of doctoral education. The appointment of supervisors and examiners must be made in accordance with BTH's guidelines. The supervisor, who is not the main supervisor of the two, must have a PhD. In addition, additional supervisors may be attached to the doctoral student, for example from the business sector, if it is of benefit to the doctoral student's studies. For these additional supervisors, there is no requirement to have a PhD.

### **2.1 Purpose of the education**

BTH conducts doctoral education to contribute to solutions to society's complex challenges and meet the demands of a changing labour market.

Specifically, the doctoral education aims to develop the doctoral student's knowledge in the subject area and ability to conduct independent research, development, teaching and investigative work based on a scientific basis in different areas of society. In addition, the purpose of the doctoral degree is to give the doctoral student the ability to critically and independently plan, initiate and lead such work.

### **2.2 Objectives of the programme**

According to the System of Qualifications in the Higher Education Ordinance (1993:100) as set out in the appendix.

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<sup>1</sup> In BTH's general syllabus, the word "doctoral student" is used synonymously with the Higher Education Ordinance "doctoral student" (according to Chapter 1, Section 4 of the Higher Education Ordinance (1993:100)). The choice of words is made to avoid confusion with doctoral studentships and that as a doctoral student, you can be admitted to a licentiate degree and not just a doctoral degree.

### **2.3 Implementation of the education**

The doctoral student conducts research and writes and defends a scientific work (licentiate thesis/doctoral thesis). To support this, the programme may include lectures, seminars, literature studies, project assignments, group supervision and individual supervision. Courses for each individual doctoral student are determined individually in consultation with the supervisors and the examiner and are included in the individual study plan.

The supervision in the programme aims to assist the doctoral student in the choice of research area, scientific method, and the organisation and planning of the scientific work and associated studies. The supervisors shall assist with subject expertise and ensure that the work maintains an international level of quality. The supervision also aims to introduce the doctoral student to the scientific community and its requirements for ethics, integrity, and critical thinking.

The doctoral student will participate in national and international contexts and present his/her own research.

During the study period, the doctoral student will take part in the scientific activity conducted within the research environment at the department/faculty by attending seminars and guest lectures, and normally give one seminar per year on his/her thesis work.

The doctoral student will carry out an oral popular science presentation of his/her research before the licentiate degree and the public defence of the doctoral thesis and write a popular science summary to be included in the licentiate thesis and doctoral thesis, respectively.

Doctoral students, employed by the university as doctoral students, are recommended to devote some time (no more than 20 percent of full time) to teaching undergraduate education. Such initiatives are funded by undergraduate education and must be described in the individual study plan.

The programme must be designed so that the doctoral student achieves the applicable qualitative targets. How each individual doctoral student's knowledge needs are to be ensured in order to fulfil the qualitative targets is stated in each individual study plan.

## **3 Eligibility and selection**

### **3.1 General entry requirements**

According to Chapter 7. Section 39 of the Higher Education Ordinance (1993:100).

### **3.2 Specific entry requirements**

To be eligible for admission to third-cycle studies, the applicant must have been awarded a second-cycle degree in a technical or mathematical-natural sciences field or have acquired knowledge in some other way to be able to benefit from third-cycle studies in the subject.

### **3.3 Selection**

According to Chapter 7. 41 § in the Higher Education Ordinance (1993:100) and current admission regulations at BTH.

Selection shall be made with regard to the applicants' ability to benefit from the programme. The basis for selection among eligible applicants is the degree of ability to benefit from the doctoral education, as well as the availability of supervision and other resources with regard to the planned focus of the licentiate thesis/doctoral thesis.

The assessment criteria applied in the selection process for doctoral studies are:

- Familiarity with the theory and applications of the subject,
- Relevant work experience, if applicable,
- Ability to express oneself in speech and writing,
- Familiarity with English,
- Creativity, initiative, independence, and ability to cooperate.

The basis for assessing the applicant's fulfilment of the assessment criteria is the results of completed university courses, the quality of the independent project and any publications, references, interviews, and a personal letter from the applicant describing the applicant's expectations and intentions for the programme. In some cases, the applicant may be required to undergo special work samples.

Admission to doctoral studies takes place continuously.

### **4 Tests included in the education**

The programme consists of courses and scientific work. Examinations that are part of doctoral studies are assessed with the grade pass/fail. The grade of the course and the licentiate thesis is determined by a specially appointed examiner. The grade of the doctoral thesis is decided by a specially appointed examining committee.

For any credit transfer, please refer to the current credit transfer procedure and guidelines for credit transfer.

### **4.1 Courses**

To support the research work, and for the fulfilment of the qualitative targets in general, the doctoral student takes a number of courses. Courses completed at BTH as well as other higher education institutions can be included.

For doctoral courses given at BTH, there must be a written course description that states, among other things, the name of the course in Swedish and English, the course objectives, content and credits. The individual study plan must regulate which courses may be included in the programme and how many credits each course is to be counted as (when participating in a course that is originally intended for first- or second-cycle level, please refer to the guidelines for credit transfer of courses in third-cycle education).

Elements of the education in the following areas are compulsory. How these are examined, through a course or other element, is regulated in each individual study plan.

- Research Methodology
- Information retrieval for researchers
- Scientific writing and review
- Ethics in research

The choice of courses shall be characterized by flexibility with regard to the doctoral student's prior knowledge and the focus of the research work and shall be determined in consultation between the doctoral student, supervisor and examiner. The form of examination is determined by the examiner in consultation with the supervisor. Goal fulfilment is assessed by the examiner.

All compulsory courses or components must be completed before the doctoral thesis is orally defended at a public defence. Other courses and modules should be chosen so that the doctoral student has both breadth and depth within the research area. The courses should also benefit the doctoral student's skills and abilities, his or her studies or scientific work.

#### **4.2 Scientific work**

Scientific work in the form of a licentiate thesis/doctoral thesis shall be designed as a coherent, scientific work (monograph) or as a summary and associated scientific papers (compilation), which the doctoral student(s) have authored alone or jointly with another person. The scientific work is written in English or Swedish.

The licentiate thesis must be defended orally at a public licentiate seminar. For further information, please refer to the "Rules for licentiate seminars" established by the university.

The doctoral thesis must be defended orally at a public defence. Prior to this, the thesis must have been quality assured as described in "Appendix – Pre-assessment of doctoral thesis in the third-cycle subject area of mechanical engineering". For further information, please refer to the "Rules for public defences" established by the university.

## 5 Degree

### 5.1 Qualitative targets

Objectives according to the System of Qualifications in the Higher Education Ordinance (1993:100), "Appendix - System of Qualifications (Higher Education Ordinance (1993:100))".

In addition to the objectives of the System of Qualifications in the Higher Education Ordinance, the doctoral student must demonstrate knowledge of gender equality issues in research.

### 5.2 Title of qualification

The title of the doctoral degree at BTH consists of a general degree with the addition of a prefix.

A doctoral student who is pursuing a licentiate degree in the subject and who has a technical qualification is<sup>2</sup> normally awarded the title of Degree of Licentiate. In other cases, the title of the degree is Degree of Licentiate.

A doctoral student who is pursuing a doctoral degree in the subject and who has a technical qualification is normally awarded the title of Doctor of Philosophy. In other cases, the title of the degree is Doctor of Philosophy.

The prefix must be clarified in the individual study plan.

## 6 Entry into force and transitional provisions

This general syllabus enters into force on 1 January 2024.

Doctoral students admitted before 1 January 2024 generally complete their studies according to an older study plan. If a doctoral student so wishes and it is deemed appropriate, the examiner concerned may approve the transition to a new general syllabus. The doctoral student must then notify the relevant dean of the transition and attach a copy of an individual study plan updated according to the new general syllabus.

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<sup>2</sup> In this context, technical education refers to a Master of Science in Engineering, a Degree of Master of Science or equivalent in a technical or mathematical-natural sciences field.

## Appendix - Pre-assessment of doctoral thesis in the third-cycle subject area of Mechanical Engineering

### 1. Introduction

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

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

It is important to stress that the opinions of external auditors 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 a reconciliation seminar according to the procedures for the doctoral education in Mechanical Engineering<sup>3</sup>.

### 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, all of them should make 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 that prescribe who may be a member of an examining committee at a dissertation at Blekinge Institute of Technology.

### 3. Format of the pre-evaluation

The format of the pre-evaluation shall follow the ex-ante evaluation 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 the pre-evaluation

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

### 5. Process for the pre-evaluations

Below 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

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[https://share.mindmanager.com/?mm\\_link\\_external=true#publish/qTm7ukMW3hj04b6CpwtFmyg2BSXzZs659E4wOXT](https://share.mindmanager.com/?mm_link_external=true#publish/qTm7ukMW3hj04b6CpwtFmyg2BSXzZs659E4wOXT)



supervisor, the reviewers in the pre-evaluation and the dean of the Faculty of Science and Engineering at BTH.

1. It is the principal supervisor's responsibility to send the pre-evaluation form to each of the reviewers, i.e. the senior researchers who will be part of the grading committee. The reviewers should 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. Each reviewer evaluates the preliminary doctoral thesis, publications, etc., and then fills in the review form according to the instructions in the form. The forms must then be signed and returned to the principal supervisor.
3. The principal supervisor collects and stores each of the forms received.
4. If all forms for the pre-evaluation are positive, the planned doctoral defence will proceed according to plan. The principal supervisor must attach the pre-evaluation review forms to the application form when applying for the public examination. If one (or more) of the evaluation reviews turns out to be negative, the principal supervisor informs the dean, the doctoral student and the other supervisors in good time.

Form for pre-assessment of doctoral thesis in the third-cycle subject area of 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 statement is only advisory and does not bind you to make a specific decision at the public defence itself. A positive opinion does not need to be followed by any reasoning or commentary. However, a negative opinion should be followed by a brief reasoning. If you summarize your considerations in written format below, keep in mind 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 <u>do not</u> consider the thesis to be 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 and defended in a public defence, summarise your considerations below.</i>	
Comment:	

Signature	
Name:	
Date:	
Signature:	

## Appendix - System of Qualifications (Higher Education Ordinance (1993:100))

### **Licentiate degree**

#### **Extent**

A licentiate degree is awarded

either after the doctoral student has completed a course of study of at least 120 credits in a subject for third-cycle studies,

or after the doctoral student has completed a part of at least 120 credits of a course of study that is to conclude with a doctoral degree, if the higher education institution decides that such a licentiate degree can be awarded at the higher education institution.

#### **Target**

##### **Knowledge and understanding**

For a licentiate degree, the doctoral student must

- demonstrate knowledge and understanding in the field of research, including current specialist knowledge in a limited part of this area as well as specialised knowledge of scientific methodology in general and the methods of the specific research area in particular.

##### **Competence and skills**

For a licentiate degree, the doctoral student must

- demonstrate the ability to identify and formulate issues critically, autonomously and creatively and with scientific accuracy, and to plan and, using appropriate methods, carry out a limited research project and other advanced tasks within predetermined time frames and thereby contribute to the formation of knowledge and to evaluate this work,

- demonstrate the ability to present and discuss, orally and in writing, research and research results in both national and international contexts in dialogue with the scientific community and society in general, and

- demonstrate the skills required to participate independently in research and development work and to work independently in some other qualified capacity.

##### **Judgement and approach**

For a licentiate degree, the doctoral student must

- demonstrate the ability to make assessments of research ethics in their own research,
- demonstrate insight into the possibilities and limitations of science, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify his or her need for further knowledge and to take responsibility for his or her knowledge development.

### **Scientific paper**

For a licentiate degree, the doctoral student must have had a scientific thesis of at least 60 credits approved.

### **Other**

For a licentiate degree with a certain specialisation, the specified requirements that each higher education institution itself determines within the framework of the requirements in this qualification descriptor shall also apply.

### **Phd**

#### **Extent**

A doctoral degree is awarded after the doctoral student has completed a course of study of 240 credits in a subject for third-cycle studies.

#### **Target**

#### **Knowledge and understanding**

For a doctoral degree, the doctoral student shall:

- demonstrate broad knowledge and a systematic understanding of the research area as well as in-depth and up-to-date specialist knowledge in a defined part of the research area, and
- demonstrate familiarity with scientific methodology in general and with the methods of the specific research area in particular.

#### **Competence and skills**

For a doctoral degree, the doctoral student shall:

- demonstrate the ability to conduct scientific analysis and synthesis as well as to independently critically examine and assess new and complex phenomena, issues and situations,

- demonstrate the ability to identify and formulate issues critically, independently, creatively and with scientific accuracy, and to plan and, using appropriate methods, conduct research and other advanced tasks within predetermined time frames, and to review and evaluate such work,
- demonstrate by means of a thesis the ability to make a significant contribution to the formation of knowledge through their own research,
- demonstrate the ability to present and discuss research and research results in both national and international contexts, orally and in writing, in dialogue with the scientific community and society in general,
- demonstrate the ability to identify the need for further knowledge, and
- demonstrate the ability to contribute to the development of society and support the learning of others, both in research and education as well as in other qualified professional contexts.

### **Judgement and approach**

For a doctoral degree, the doctoral student shall:

- demonstrate intellectual independence and scientific probity as well as the ability to make assessments of research ethics, and
- demonstrate in-depth insight into the possibilities and limitations of science, its role in society and the responsibility of the individual for how it is used.

### **Scientific dissertation (doctoral thesis)**

For a doctoral degree, the doctoral student must have received a passing grade for a scientific thesis (doctoral thesis) of at least 120 credits.

### **Other**

For a doctoral degree with a certain specialisation, the specified requirements that each higher education institution itself determines within the framework of the requirements in this qualification descriptor shall also apply.