

International Office, LTH

## **General syllabus for third-cycle studies in Mechanical Engineering Sciences, TEMAVF00**

The syllabus was approved by the Board of the Faculty of Engineering, LTH, on 17 June 2021 (Reg. no U 2021/55).

### **1. Subject description**

The third-cycle subject Mechanical Engineering Sciences encompasses theoretical, experimental and applied mechanical engineering science in a broad sense and focuses on long-term sustainability. All aspects of the subject can be encapsulated and collectively referred to as Mechanical Engineering Sciences. The subject is fairly broad and research issues overlap, for example, it may include mechanics of materials, materials engineering, component design, production and material engineering. Analytical, numerical and experimental research methods are used in the subject. The field of work spans several TRLs (Technology Readiness Levels) from basic research to applied research and industrial implementation.

A more detailed description of the subject is available and reflects current and planned activities concerning possible third-cycle projects, related supervisor capacity and available infrastructure. The subject is rapidly evolving in view of the ongoing development towards increased sustainability, which means that the more detailed subject description is continuously updated.

## 2. Objective of third-cycle studies at LTH

The Board of LTH established the following objective for third-cycle studies on 15 February 2007.

The overall objective of third-cycle studies at LTH is to contribute to social development and prosperity by meeting the needs of business and industry, academia and wider society for staff with third-cycle qualifications. LTH shall primarily provide education leading to a PhD or licentiate in the fields of LTH's professional degrees. The programmes are first and foremost intended for the further training of engineers and architects. The programmes are designed to encourage personal development and the individual's unique qualities.

Third-cycle graduates from LTH shall demonstrate:

- proficiency in research theories and methods and in a critical, scientific approach
- both breadth and depth of knowledge within the subject of his or her third-cycle studies

The programmes aim to develop:

- creativity and independence with the ability to formulate advanced research issues, solve problems and plan, carry out and evaluate projects within a set time frame
- openness to change
- personal networks, both national and international
- social skills and communication skills
- teaching ability
- innovation skills, leadership and entrepreneurship

In order to enable students to achieve these skills and abilities, LTH provides:

- high-quality supervision and good conditions for study in a creative environment
- a good balance between basic and applied research, with openness to wider society

- a range of advanced third-cycle courses at both departmental and faculty level
- a good balance between courses and thesis work
- opportunities to present research findings at national and international conferences and in internationally recognised journals, or by another equivalent method which leads to wide exposure and circulation
- opportunities to spend time in international research environments for short or extended periods

### 3. Learning outcomes for third-cycle studies

The learning outcomes for third-cycle studies are given in the Higher Education Ordinance.

#### 3.1 Licentiate

##### *Knowledge and understanding*

For a 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 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

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

## **3.2 Doctor of Philosophy**

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

For the degree of Doctor of Philosophy 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
- 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 of Philosophy the third-cycle student shall:

- demonstrate the capacity for scholarly analysis and synthesis as well 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 thesis 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
- 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 of Philosophy the third-cycle student shall:

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics
- 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

### ***Midway Review***

A midway review, with the aim of reviewing the doctoral student's education in relation to the learning outcomes for the degree in the Higher Education Ordinance, is to be implemented at least once during the doctoral student's programme for all doctoral students whose education is to conclude with a doctoral degree.

## **4. General and specific admission requirements**

### **4.1 General admission requirements**

A person meets the general admission requirements for third-cycle studies if they:

- have been awarded a second-cycle qualification, or

- have satisfied the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded in the second-cycle, or
- have acquired substantially equivalent knowledge in some other way in Sweden or abroad.

The higher education institution may permit an exemption from the general entry requirements for an individual applicant, if there are special grounds. Ordinance (2010:1064).

#### **4.2 Specific admission requirements**

A person meets the specific admission requirements if they have:

- at least 90 credits of relevance to the field, including at least 60 second-cycle credits, or
- a second-cycle degree in a relevant field.

Finally, the student must be judged to have the potential to complete the programme.

Exemptions from the admission requirements may be granted by the Board of LTH.

### **5. Selection**

Selection for third-cycle studies is based on the student's potential to profit from such studies.

The assessment of potential in accordance with the first paragraph is made primarily on the basis of academic results from the first and second cycle. Special attention is paid to the following:

- Knowledge and skills relevant to the thesis project and the subject of study. These may be demonstrated through documents appended to the application and at a possible interview.
- An assessment of ability to work independently and to formulate and tackle research problems. The assessment could be made on the

basis of the student's degree project and a discussion of this at a possible interview.

- Written and oral communication skills
- Other experience relevant to the third-cycle studies, e.g. professional experience.

## 6. Degree requirements

Third-cycle studies conclude with a PhD or, if the student wishes or if it has been specified in the admission decision, with a Degree of Licentiate. The student also has the right to complete a licentiate as a stage in their third-cycle studies, but is not obliged to do so.

The requirements for a Degree of Licentiate are:

- passed courses of at least 30 credits
- a passed thesis of a scope corresponding to studies of at least 60 credits.

The thesis and courses shall comprise at least 120 credits in total.

The requirements for a PhD are:

- passed courses of at least 60 credits
- a passed thesis of a scope corresponding to studies of at least 120 credits.

The thesis and courses shall comprise at least 240 credits in total.

### 6.1 Degrees awarded

The programme can lead to the following degrees:

- *Teknologie licentiatexamen*/Licentiate in Engineering
- *Teknologie doktorsexamen*/Doctor of Philosophy in Engineering

or:

- *Filosofie licentiatexamen*/Licentiate of Philosophy
- *Filosofie doktorsexamen*/Doctor of Philosophy

## 7. Course component and implementation of the programme

The programme is to include courses. For each course, an examiner shall be appointed at the department that delivers the course. The examiner shall draw up a written syllabus which states the course title in Swedish and English, the learning outcomes of the course, the course content and the number of credits.

The individual study plan is to include details of which courses the individual student shall or may include in their studies and how many credits for each course may be included in the degree. Courses taken at other faculties or higher education institutions may also be included in the study plan. The selection of courses shall, as far as possible, support the subject and selected third-cycle projects which form the basis of the thesis.

It is compulsory to participate in and pass the course Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*) GEM056F or the equivalent, and pass the course Research Ethics (*Forskningsetik*), GEM090F.

The course component aims to give the third-cycle student a broad scientific basis within key areas of the third-cycle subject. It also provides the third-cycle graduate with the tools to swiftly delve into new research areas.

The following guidelines apply to the design of the course component of the programme.

For a degree of Licentiate or Doctor, the third-cycle student is to include courses in subjects such as materials engineering, solid mechanics, mathematics, numerical methods, measurement and signal processing and courses linked to different experimental methods. Depending on course selection, some other courses may be

compulsory, such as courses related to personal safety, handling of specific research equipment and complementary first-cycle courses.

## 8. Thesis

The programme shall include a research project documented in a licentiate or PhD thesis.

There is a difference in the content of a licentiate and PhD thesis. A licentiate is to demonstrate thorough knowledge of the current research front, whereas a PhD thesis is to contribute to the development of research which leads to societal benefit from different time perspectives.

Third-cycle students should participate in international conferences in order to gain an introduction to the research field. Subsequently, they should also present individual research at international conferences as it will confirm their ability to present their ideas and findings to a qualified audience. It will also give the students opportunities to establish a personal network of contacts. The students are also to participate in the seminar activities at the department. Furthermore, it is important that the students are enabled to cultivate contacts with industry through visits and collaboration. The programme includes elements to develop the students' collaborative skills and leadership.

In addition to the individual study plan, the third-year students are to continuously monitor, in conjunction with the group of supervisors, how the general learning outcomes of the programme are attained; for example by using a log book to document the various stages in the programme that contribute to the attainment of the learning outcomes in question.

### 8.1 Licentiate thesis

The licentiate thesis (licentiate report) can be written as a compilation thesis or a monograph. It is to address the chosen research area as well as issues of principle and specific aspects of the subject. It shall be

possible for the reader to form an understanding and view of the research front within the field through the thesis. Furthermore, the licentiate thesis may include drafts and ideas which may be relevant for the PhD. The thesis is to be presented at a public seminar moderated by a critical reviewer. The thesis shall be available for scrutiny at the time of the seminar. The critical reviewer is not to be a member of the departmental staff.

## 8.2 PhD thesis

The PhD thesis is to be written as a compilation thesis or a monograph. The compilation thesis is to include papers that have been or will be published in international peer-reviewed journals. The content of the PhD thesis should normally consist of three to four papers of this kind.

Overall, the PhD thesis is to demonstrate that the author is qualified to contribute to the development of research.

## 9. Other rules and regulations

The doctoral students are usually to participate in first and second-cycle teaching and other departmental duties as part of their development.

## 10. Transitional provisions

For doctoral students with an admission date of 1 January 2019 or later, it is compulsory to participate in and pass the course Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*) GEM056F or the equivalent in order to fulfil the requirements for the degree.

For doctoral students admitted on or after 1 January 2021, it is compulsory to attend and pass the course Research Ethics (*Forskningsetik*), GEM090F.

Midway reviews are compulsory for doctoral students admitted on or after 1 January 2019.