



GENERAL SYLLABUS FOR THIRD-CYCLE PROGRAMMES IN MACHINE ELEMENTS

TFN chair 2019-03-28

1 Subject Area

Machine Elements includes analysis and optimisation of components and systems based on performance, durability, energy efficiency, reliability and sustainability. Particular emphasis is placed on the field of tribology.

2 Programme curriculum

Education at third-cycle level in Machine Elements that concludes with a Degree of Licentiate is comprised of a total of two years' full time study (120 credits) and consists of a study programme that results in 50-60 course credits and a licentiate thesis that results in 60-70 thesis credits.

Education at third-cycle level in Machine Elements that concludes with a Degree of Doctor is comprised of a total of four years' full time study (240 credits) and consists of a study programme that results in 80-100 course credits and a doctoral thesis that results in 140-160 thesis credits.

The education comprises four years of full-time study. Studies are preferably pursued within the framework of a post as employed post-graduate with at least 80% of the time reserved for the student's own studies. Teaching and departmental duties are normally included up to a maximum of 20%. The education's composition of research projects and courses are fixed in the post-graduate's individual study programme.

An individual study plan is drawn up for every third-cycle student (according to a fixed model) where the study programme is specified in detail. A follow-up and update of the plan is done at least twice a year by the third-cycle student and his/her supervisor and is approved by the Head of Department at least once a year, as delegated by the Vice-Chancellor.

The study programme consists partly of broad courses that aim to give the student a sound knowledge of the Machine Elements field and partly of individual courses involving studies of the latest research in the student's own field of research. A number of compulsory and elective courses are listed in the "PhD-student Handbook" which can be found on the subject's website.

It is strongly encouraged, but not mandatory, that the licentiate and doctoral thesis include components of both experimental and analytical work. Parts of the work for a licentiate thesis may constitute parts of a doctoral thesis. The scientific quality of a licentiate or doctoral thesis shall be such that international publication in journals or conference proceedings, subjected to peer-review, is possible.

The research work is communicated to the scientific community and other external parties through articles in scientific journals and at scientific conferences and through participation in conferences and collaborative projects.



3 Eligibility and selection

3.1 General eligibility requirements

An individual fulfils the general eligibility requirements for the third-cycle educational programme when he or she 1) has completed a second-cycle degree, 2) has completed higher education courses worth at least 240 credits, of which at least 60 are for second-cycle courses, or 3) in some other manner, in this country or abroad, has acquired the equivalent qualifications. The faculty board may permit an exemption from the requirement of basic eligibility in the case of an individual applicant, if there are special grounds as written in Chapter 7, Section 39 of the Higher Education Ordinance (2010:1064). Also refer to the local guidelines laid down in the Admission Rules for Third-cycle Education at Luleå University of Technology.

3.2 Specific eligibility requirements

A Master of Science degree in Engineering or a Master's degree in one of the principal areas approved by the Board of Faculty of Science and Technology (or equivalent) and proficient in oral and written communication in English.

3.3 Selection

Selection from among applicants meeting the requirements shall be made with reference to their ability to benefit from the education. The mere fact that an applicant is deemed able to receive credit towards the education for previous education or working activities may not alone give the applicant precedence over other applicants in the selection process, as per Chapter 7, Section 41 of the Higher Education Ordinance (2010:1064). Also refer to local guidelines laid down in the Admission Rules for Third-cycle Education at Luleå University of Technology.

In the selection of third-cycle education in Machine Elements the following applies to the selection criteria:

- Knowledge relevant for this project,
- Degree project quality,
- Personal qualities relevant for third-cycle education.

4 Examinations included in the education

The education consists of courses and an academic thesis. Examinations included in third-cycle programmes are graded as either Pass or Fail. Course and licentiate thesis grades are decided by specially appointed teachers (examiners). Doctoral thesis grades are decided by a specially appointed grading committee.

4.1 Courses

The compulsory courses or course areas are presented in detail in the "PhD-student Handbook" which can be found on the subject's website. Compulsory courses cover the fundamentals in Machine Elements and Tribology as well as methodologies important for



research in the Machine Elements subject. Courses where knowledge and skills are trained in the following areas are also encouraged:

- Leadership,
- Project management,
- Sustainability in all three aspects (environmental, social, and economic)

It is strongly encouraged that the student in the third-cycle education acquires international experience through, for example, shorter stays at foreign universities, participation in international conferences, and collaboration with international researchers.

Goal attainment is tested by means of the form of examination specified in the syllabus.

4.1.1 Recognition of prior studies

As specified in the local guidelines laid down in the Admission Rules for Third-cycle Education at Luleå University of Technology.

4.2 Academic thesis

An academic project in the form of a dissertation/thesis in Machine Elements shall be presented as a comprehensive summary including the academic essays (composite thesis) that the third-cycle student has written alone or together with another person or persons.

The third-cycle study process is described in detail in the “PhD-student Handbook” which can be found on the subject’s website. The process includes a number of seminars and documents to be finished according to a given time plan.

The licentiate thesis is defended orally at a public licentiate seminar and is graded as either Pass or Fail. When the thesis is graded both the content of the thesis and the defence of the thesis are taken into consideration. The grade of a licentiate thesis is decided by an examiner appointed by the Head of Department.

The doctoral thesis is defended orally at a public dissertation and is graded Pass or Fail. When the thesis is graded, both the content of the thesis and the defence of the thesis are taken into consideration. Grades for a doctoral thesis should be decided by a grading committee that is appointed for each thesis.

5 Degree

In Machine Elements, a third-cycle student who has been admitted to a Degree of Doctor of Philosophy has the possibility to take a Degree of Licentiate Engineering after completing one part comprising at least 120 credits of a study programme intended to conclude with the award of a Degree of Doctor.

5.1 Degree objectives

As specified in the Qualifications Ordinance (Higher Education Ordinance, Annex 2 – Degree Ordinance). See also the Annex below.

The third-cycle student in the subject of Machine Elements shall:



- Publish in internationally renowned journals. For the degree of Licentiate at least one paper should have been submitted for publication. For the Degree of Doctor at least two papers should be accepted for publication or already been published.
- Present their work at international conferences of significant importance. For the degree of Licentiate at least one oral presentation should have been completed. For the Degree of Doctor at least two oral presentations should have been completed.
- Be prepared for a career as professional researcher, in academia or elsewhere.

More precise instructions about how to achieve the Higher Education Ordinance objectives as well as the objectives for the subject of Machine Elements are given in the “PhD-student Handbook” which can be found on the subject’s webpage.

5.2 Degree title

A third-cycle student who takes a Degree of Licentiate in Machine Elements receives the degree title of Licentiate of Engineering.

A third-cycle student who takes a Degree of Doctor in Machine Elements normally receives the degree title of Doctor of Philosophy.

Requests for other degree titles are made according to established guidelines.

6 Entry into effect and interim regulations

The previous general syllabus for Machine Elements will cease to apply for third-cycle students who are admitted to studies at third-cycle level after 2019-03-28.

If agreed between the third-cycle student and the supervisors, the new general syllabus (LTU-1139-2019) may be used as a steering document for a previously admitted third-cycle student. It must be documented in the third-cycle student’s individual study plan which general syllabus that applies.



Qualifications ordinance (Higher Education Ordinance, Annex 2)

Contents

- the qualifications that may be awarded in the third cycles, and
- the requirements to be fulfilled for the award of each qualification (qualification descriptors).

THIRD-CYCLE QUALIFICATIONS

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 Degree of Doctor, if a higher education institution decides that a 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 skills 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 skills 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 skills 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 skills 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 at least 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

- demonstrate the capacity for scholarly analysis and synthesis as well as review and assess new and complex phenomena, issues and situations autonomously and critically
- demonstrate the skills to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research



and other advanced tasks within predetermined time frames and to review and evaluate such work

- demonstrate through a dissertation the skills to make a significant contribution to the formation of knowledge through his or her own research
- demonstrate the skills 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 skills 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. Ordinance (2008:132)