

## GENERAL SYLLABUS FOR EDUCATION AT THIRD-CYCLE LEVEL IN EXPERIMENTAL PHYSICS

TFN Chair 19/03/2015

### **1 Subject Area**

Experimental Physics comprises experimental physics with an emphasis on material science research on micro and nano length scales, and that are closely and widely related to applications and applied research

### **2 Programme curriculum**

Education at third-cycle level in Experimental Physics 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 credits and a licentiate thesis that results in 60–70 credits.

Education at third-cycle level in Experimental Physics 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 60–120 credits and a doctoral thesis that results in 120–180 credits.

The education is planned in such a way that the candidate will be able to appropriate in-depth knowledge in Experimental Physics. This is executed through the choice of selected courses coupled with an advanced scientific research project. The third-cycle student will be given the opportunity to develop their knowledge of planning and executing research projects, as well as to publish and present scientific results. This training is acquired by the third-cycle student through learning how to carry out literature research and analysis, presenting their research results at international conferences, by gaining larger responsibilities in writing their own publications, by being in charge of the publication process, and by being part of the work involved in preparing, submitting and managing research applications.

The doctoral student will be integrated in a stimulating research environment composed of students at different career level, and several senior researchers/supervisors. The doctoral student will be also connected with the research network at the national and international level, and part of their research will be carried out in the framework of scientific collaborations, boosting the international side of career development, both from the viewpoint of research and of labor market.

After completing their education they will be able to partake in world class research projects in order to disseminate research results and to interact with the major players within industry and academia both nationally and internationally.

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 of the plan is held 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.

### **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**

Degree of Master of Science in Engineering/Degree of Master of Science.

Main field of study: Physics, Chemistry or equivalent, 60 credits (second cycle).

Very good command of 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 Experimental Physics the following applies to the selection criteria:

- Knowledge and skills relevant to the specific project
- The quality of the applicant's degree project
- Personal qualities relevant to education for third-cycle education

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.

### **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**

A set of mandatory and selected courses will be part of the final examination, which are project or competency related, and will be decided and included in the individual study plan. 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 Experimental Physics shall be presented as a homogenous, cohesive academic work (monograph) or a brief, yet comprehensive summary of academic essays (composite thesis) that the third-cycle student has written alone or together with another person or persons.

Thesis manuscripts shall be presented at one or more research seminars or be subjected to equivalent review through the agency of the department.

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 disputation 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 Experimental Physics, a third-cycle student who has been admitted to a Degree of Doctor has the possibility to take a Degree of Licentiate 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.

#### **5.2 Degree title**

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



A third-cycle student who takes a Degree of Doctor in Experimental Physics 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**

General syllabus for Experimental Physics applies for admission of third-cycle students admitted 2015-03-19 and later.

## **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)