

Quality Support, LTH

General syllabus for third-cycle studies in Physics TEFAFF00

The syllabus was approved by the Board of the Faculty of Engineering/LTH 24 September 2007 and most recently amended 17 June 2026 (reg. no U 2026/189).

1. Subject description

Physics is a branch of science that studies matter, energy, and their interactions through space and time, as well as the fundamental laws that govern the structure, dynamics, and forces of the universe.

Physics encompasses research in both traditional areas of physics and newer, including interdisciplinary, research fields that involve physics. The research may be based on theoretical and/or experimental methodologies, or combinations of these.

Research may also involve the development of (new) models for computation, measurement methods, instrumentation, and simulations, which are central to physics but can also serve as tools in other research fields such as astronomy, chemistry, engineering, and medicine. The research may be of both fundamental and/or applied nature.

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

As an intermediate milestone in the doctoral programme, a compulsory mid-term seminar must be held after two years of effective study. The mid-term seminar is mandatory for all doctoral students whose studies are intended to lead to a doctoral degree, but may, at the student's request, be replaced by a seminar for the licentiate degree.

In connection with this, a midway review is carried out with the purpose of assessing the student's education in relation to the learning outcomes set out in the Higher Education Ordinance. This applies to all doctoral students whose studies are to be completed 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 courses and study programmes if he or she:

- has been awarded a second-cycle qualification, or

- has satisfied the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded in the second cycle, or
- has 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 for third-cycle programme in Physics, if they:

- completed at least 45 second-cycle credits in physics, engineering physics or an associated field, or
- has a second cycle degree in physics, engineering physics or an associated field.

In order to enable interdisciplinary initiatives and important specialisations in certain areas, students with qualifications in subjects other than Physics may be considered for admission. The specific entry requirement may then have been obtained through other equivalent education, which is assessed in each individual case.

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 lead to a PhD or, if the student wishes or if it has been specified in the decision on admission, to a licentiate. The student also has the right to complete a licentiate as a stage in his or her third cycle studies, but is not obliged to do so.

The requirements for a licentiate are:

- passed courses of 30–45 credits, and
- a passed thesis of a scope corresponding to studies of 75–90 credits.

The thesis and courses shall comprise 120 credits in total.

The requirements for a PhD are:

- passed courses of 60–75 credits, and
- a passed thesis of a scope corresponding to studies of 165–180 credits.

The thesis and courses shall comprise 240 credits in total.

The requirements for passed courses may be tailored to individual students within the specified credit ranges, based on their prior knowledge of physics, for example in the case of interdisciplinary recruitment. See 'Basic knowledge' below.

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

On the degree certificate it will then be added: “In the subject: Physics” / “Inom ämnet: Fysik”.

7. Course component

The programme is to include courses and other programme components. 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 and components the individual student shall or may include in his or her 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. In addition to the mandatory courses, the composition of courses shall be individually adjusted to the student’s prior knowledge and needs.

7.1 Licentiate

Compulsory courses and components:

- Introductory course for new doctoral students in physics
(*Introduktionskurs för nya forskarstudenter i fysik*), 1,5 credits

- Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*), 2 credits, or the equivalent
- Research Ethics (*Forskningsetik*), 3 credits
- Introduction to Teaching and Learning in Higher Education (*Högskolepedagogisk introduktionskurs*) GEM002F, 5 credits, or the equivalent

In choosing optional courses and other components, the students should seek to achieve a balance between courses that broaden their general knowledge of physics or adjacent areas, courses that provide specialisation within areas of relevance to their thesis topic, and general courses (LTH-wide courses, programming, presentation techniques etc.).

Basic knowledge:

If the student lacks course credits in physics from first or second cycle levels the required course credits can be increased up to 45 credits, by including more broadening courses in Physics.

7.2 Doctor of Philosophy

Compulsory courses and components:

- Introductory course for new doctoral students in physics (*Introduktionskurs för nya forskarstudenter i fysik*), 1,5 credits
- Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*), 2 credits, or the equivalent
- Research Ethics (*Forskningsetik*), 3 credits
- Introduction to Teaching and Learning in Higher Education (*Högskolepedagogisk introduktionskurs*) GEM002F, 5 credits, or the equivalent

In choosing optional courses and other components, the students should seek to achieve a balance between courses that broaden their general knowledge of physics or adjacent areas, and courses that provide specialisation within

areas of relevance to their thesis topic, and general courses (LTH-wide courses, programming, presentation techniques etc.).

Basic knowledge:

If the student lacks course credits in physics from first- or second-cycle levels the required course credits can be increased up to 75 credits, by including more broadening courses in Physics.

8. Thesis

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

8.1 Licentiate thesis

The Licentiate thesis can either be written as a summary of at least one research article (or manuscript), which the doctoral student has authored alone or in cooperation with others, or as a unified research report (monograph). The thesis must be of a quality required for publication in recognised peer-reviewed journals and it must be possible to determine the contributions of different authors. For more information on summary and monograph theses, see the compilation thesis and monograph thesis sections below.

8.2 PhD thesis

The PhD thesis is to be a thought-out and reasoned discussion of the student's own work in relation to the broader research area and can be written as a compilation thesis or as a monograph.

A compilation thesis consists of copies of a number of research articles or manuscripts and a summarising chapter (kappa). The research articles must be of a quality required for publication in recognised peer-reviewed journals and it must be possible in the thesis to determine the doctoral student's contribution to the articles.

In a compilation thesis it is rarely the case that research papers are solely authored by the doctoral student. Emphasis must therefore be placed on the summarising chapter, in which the autonomous and independent intellectual ability of the doctoral student can be demonstrated and assessed. The summarising chapter must provide an introduction to the papers and situate research issues and findings in a broader context. It must therefore be written in a different form than the papers included in the thesis in order to be read as an independent scholarly text. The summarising chapter must not contain extensive duplication of text, figures and tables from the papers.

A monograph thesis is a unified report including descriptions of the research tasks, research issues, methods, analysis, findings and discussion. In particular, the monograph thesis is to present the student's own research in such a way that the methods applied, findings obtained and conclusions drawn can be understood and assessed.

The thesis must relate to the outcomes defined in the Higher Education Ordinance, which means that the aim of the compilation thesis and the monograph is mainly to:

- demonstrate current specialist knowledge as well as a broad and deep understanding of the research field
- demonstrate the ability to situate the thesis within a broader theoretical and research context
- clearly state the aim of the thesis including its main hypotheses and research issues
- demonstrate familiarity with the methods and analytical tools used in the field of research as well as the ability to assess and evaluate them
- demonstrate the ability to reflect on the significance and limitations of their own research
- significantly contribute to the formation of knowledge in the field and identify the need for further knowledge.

The thesis must contain a popular science summary, which can be written in Swedish or English.

9. 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 earn a Pass grade on the course Research Ethics, GEM090F.

The midway review is compulsory for doctoral students admitted on or after 1 January 2019.

For doctoral students with an admission date of 1 January 2022 or later, it is compulsory to participate in and pass the courses:

- Introductory course for new doctoral students in physics (*Introduktionskurs för nya forskarstudenter i fysik*) FAF030F, and
- Introduction to Teaching and Learning in Higher Education (*Högskolepedagogisk introduktionskurs*) GEM002F, or the equivalent

The half-time seminar with focus on the broader context is compulsory for doctoral students with an admission date of 17 June 2026 or later.

Doctoral students admitted before 17 June 2026 may have a distribution of credits between coursework and thesis in accordance with the general study plan, ref. no. U 2022/494.