Applied Physics/Tillämpad fysik/

SCB code: 10399, 20999, 21001

1 General description of the research area

Applied Physics is concerned with the applications of physics in biology, chemistry, medicine, life sciences, electronics, nanoscience, materials science, and other fields. The research aims to apply physical methods, models, and approaches across scientific disciplines, such as surface and molecular physics, biotechnology, lab-on-a-chip, organic electronics, material optics, bio-, optical- and chemical sensors, self-organizing materials, polymers and soft materials.

Many projects in the subject are linked to the life sciences, and PhD studies are often conducted in collaboration across departmental boundaries (IFM and ITN), with other parts of the university, with international research groups, and with national and international industry. The aim is to provide students with different backgrounds the opportunity to pursue doctoral education in a multidisciplinary environment.

2 Eligibility requirements and selection

The basic eligibility requirements as well as the general principles for selection are specified in the faculty's *Study Handbook for PhD Studies*.

2.1 Specific eligibility requirements

Specific eligibility requirements for PhD education in Applied Physics are met by those who have completed at least 60 ECTS at the master's level in a research field relevant to the subject. These 60 ECTS must include an independent thesis of at least 30 ECTS in a field relevant to the subject of Applied Physics.

3 Degree

PhD studies in Applied Physics lead to a Degree of Doctor or a Degree of Licentiate. The latter degree can also serve as a stage in the PhD studies. The Degree of Licentiate comprises at least 120 ECTS, of which the thesis corresponds to 90 ECTS, and courses to at least 30 ECTS, of which at least 20 ECTS must be at PhD level. The Degree of Doctor comprises 240 ECTS, of which the thesis corresponds to 180 ECTS, and courses to 60 ECTS, of which at least 40 ECTS must be at PhD level.

4 Goals and implementation of the PhD studies

The general goals and objectives of PhD studies are specified in the introduction to the faculty's *Study Handbook for PhD Studies*, as well as in the Higher Education Ordinance (reprinted in the *Study Handbook*'s appendix A).

PhD studies in Applied Physics provide the PhD student with the conditions to meet all degree objectives. The education consists of research and dissertation work, courses, participation in

seminars, involvement in national and international conferences, often in collaboration with industry.

Specifically, PhD students in Applied Physics should, upon completion of studies, demonstrate:

- Solid subject knowledge in biology, physics, chemistry, electronics, materials science, and biotechnology relevant to the chosen research direction.
- Strong skills in planning and conducting experiments, and in using modern research equipment and/or computational methods relevant to the chosen research direction.

The education provides the PhD student with broad knowledge and understanding within the research area through breadth-oriented courses, seminar series at department and division level, and activities within interdisciplinary graduate schools.

The PhD student acquires deep knowledge and understanding within the subject, and particularly within their research specialization, through project work, participation in research group seminars and discussions, advanced subject-relevant courses, and participation in conferences.

The PhD student develops the ability to independently and critically plan, lead, conduct, and communicate research and development projects. After graduation, the PhD student is well prepared for research and development work in both academia and industry.

The PhD student develops familiarity with scientific methodology by applying methods of the research field in their own research and by completing a mandatory course in research methodology.

The education also provides the PhD student with a deeper understanding of the potential of science to contribute to sustainable societal development. This is achieved through mandatory faculty courses, continuous discussions at research seminars, and reflection on the sustainability aspects of their own research.

Academic judgement and approach are developed through courses in research ethics, active participation in seminars and conferences, collaboration with research groups and partners, and through the writing of a dissertation that demonstrates intellectual independence.

These skills and abilities are achieved by, for example:

- Independently planning, conducting, analyzing, and critically evaluating experimental research.
- Participating in research group seminars, presenting results, discussing plans for future work, and critically evaluating research.
- Presenting research results at national and international conferences, orally and/or as posters, and participating in discussions.
- Gradually taking responsibility for producing research reports and scientific articles, first under supervision and later independently.
- Critically reviewing scientific reports and articles produced by others.
- Participating in activities within interdisciplinary graduate schools.
- Taking complementary courses outside the core subjects, such as presentation techniques, leadership, management, intellectual property rights, methodology/ethics, and pedagogy (mandatory for teaching PhD students).

PhD studies normally require four years of full-time study for a Degree of Doctor and two years for a Degree of Licentiate. If teaching or departmental duties are included, study time may be extended by up to one year for the Degree of Doctor and six months for the Degree of Licentiate.

4.1 Thesis

The overall rules regarding the format, submission and grading of a thesis can be found in the faculty's *Study Handbook for PhD Studies*.

The PhD student demonstrates their ability to significantly contribute to the development of knowledge through their own research by writing a doctoral or licentiate thesis, the scientific quality of which must be approved by a grading committee (doctoral thesis) or an examiner (licentiate thesis).

4.1.1 PhD Thesis

The thesis corresponds to 180 ECTS. It may be written as a monograph or a compilation thesis. The thesis must be of a quality that is suitable for publication in established scientific journals. In a compilation thesis, a substantial part of the included papers should be accepted for publication. The student's individual contribution must be clearly indicated.

4.1.2 Licentiate Thesis

The thesis corresponds to 90 ECTS. It may consist of one or several scientific articles (including manuscripts) and/or a research report. It may be written as a monograph or as a compilation thesis consisting of articles and an introductory summary.

4.2 Mid-term seminar

The mid-term seminar is mandatory for PhD students who intend to complete a Degree of Doctor but who do not present a licentiate thesis. The seminar is normally held halfway through the studies and is documented in the individual study plan.

4.3 Individual study plan

An individual study plan will be formulated for each PhD student. The detailed planning of courses and other components will be conducted in consultation with the supervisor and documented in the individual study plan (see *Study Handbook for PhD Studies*, section 5.3). The study plan should be established within one month after admission to PhD studies, and it should be revised at least once a year.

4.4 Supervision

The general regulations for supervision can be found in the *Study Handbook for PhD Studies*, section 4, and in the faculty's policy for supervision of PhD studies.

4.5 Courses

4.5.1 Faculty course requirements

Scientific theory, methodology, ethics, gender equality and sustainability

All PhD students admitted should complete mandatory courses as decided by the faculty in Scientific theory, methodology, ethics, gender equality and sustainability, or be deemed to have equivalent competencies, in order to receive a degree.

Pedagogic studies

All PhD students who teach should complete a basic course in pedagogy. At least 3 ECTS from this course should be included in the PhD studies, and any remaining credits should be counted as departmental duties (see *Study Handbook for PhD Studies*, section 5.5).

4.5.2 Subject related courses

For the total course requirements, see under Degree. Due to the interdisciplinary character of the subject, PhD courses must be adapted to the student's background and specialization. At least 38 ECTS in the core subjects (including possible accredited courses) are required for the Degree of Doctor, and at least 15 ECTS in the core subjects for the Degree of Licentiate. What constitutes core subjects is determined individually in each student's study plan.

4.5.3 Other courses

Courses from other departments or universities, summer schools, and self-studies in fields relevant to the research specialization may also be included. Activities such as symposia, seminars, and commissioned research may also be recognized as PhD study activities after approved examination (written, oral, or other agreed form of assessment).

4.5.4 Accreditation

Accreditation of course credits is regulated by the *Study Handbook for PhD studies*, section 5.6.

5 Other information

5.1 Transitional provisions

Changes to the general study syllabus do not apply to those who have already been admitted to PhD studies in the research area. A change to the new general study syllabus may however be approved if both the main supervisor and the PhD student agree. In such a case, this should be documented in the individual study plan.

6 Commencement

1. The General study plan comes into force 01 07 2025.