Reg. no HNT 2024/803
Approved 12 December 2024

Faculty of Health, Science and Technology

Programme Syllabus

Master's Programme in Physics – Nanomaterials

Programme code:	TAMFN
Programme title:	Master's Programme in Physics – Nanomaterials *Masterprogram i fysik – inriktning nanomaterial*
Credits:	120
Programme approval:	The programme syllabus was approved by the Faculty Board of Health, Science and Technology on 12 December 2024 and is effective from the autumn semester 2025.
Language of instruction:	Swedish or English
Education cycle:	Second (Master's)
Degree type:	General
Degree title:	Degree of Master in Physics
Entry requirements:	Degree of Bachelor in Physics, or equivalent where at least 90 credits in physics are included. Upper secondary level English B/English 6 or equivalent.

General information

The programme concludes with a Degree of Master in Physics. Graduates from the programme will have a broad expertise, and their knowledge of fundamental and applied physics is useful within many areas of engineering. Thanks to their expertise in the theoretical understanding of physical phenomena, graduates can provide vital contributions to the development of new technological applications that support sustainable development. One example is the field of nanotechnology, in which the structure of matter is used to develop new applications in, for example, different types of photovoltaic cells, nanoelectronics and quantum computers.

The programme focuses on the development of the students' engineering excellence and ability to cooperate with others. Graduates from the Master's Programme in Physics at Karlstad University will be able to work with planning, development, design, production and application of systems where advanced technology and modelling are central.

The programme provides insight into the physicist's role in social and economic societal development, and prepares students to work responsibly in their future profession. The programme provides knowledge and skills that are in demand both in Sweden and internationally, along with a strong foundation in natural sciences, technology and mathematics. The programme also enhances the students' personal characteristics and approaches.

Programme outcomes

The Higher Education Ordinance, System of Qualifications, specifies the outcomes required for certain degrees. The outcomes for a Degree of Master (120 credits) are as follows:

Knowledge and understanding
For a Degree of Master (120 credits) the student shall
demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
demonstrate specialised methodological knowledge in the main field of study.

Competence and skills
For a Degree of Master (120 credits) the student shall
demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information,
demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work,
demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgement and approach
For a Degree of Master (120 credits) the student shall
demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work,
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 ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Independent project (degree project)
A requirement for the award of a Degree of Master (120 credits) is completion by the student of an independent project (degree project) for at least 30 credits in the main field of study. The degree project may comprise less than 30 credits, however no less than 15 credits, if the student has already completed an independent project in the second cycle for at least 15 credits in the main field of study or the equivalent from a programme of study outside Sweden.

Programme structure

The programme covers four semesters and comprises courses within the main field of study of at least 60 credits, including a degree project of 30 credits.
Progression is ensured by the implementation of increasingly complex learning outcomes, which are designed to both provide specialisation and form the basis for assessment. Different forms of teaching methods, working methods and examination formats are used in the programme, ensuring scientific, methodological, content, language and professional specialisation and development. Establishing a strong connection to current research is particularly important for scientific and methodological specialisation.
Karlstad University's continual quality development is ensured by enthusiastic lecturers offering quality courses. Student evaluations, contact with alumni and student representation in preparatory and decision-making bodies play an important role in this respect. Through partnerships and the inclusion of external representatives in preparatory and decision-making faculty bodies, the degree programme maintains its relevance in relation to the wider community.

Internationalisation

Karlstad University wants to promote collaboration and exchange with other universities and has partnerships with many other universities in Sweden and abroad, as well as an organisation in place to support students who want to make use of this opportunity. Students are therefore encouraged to complete part of the programme at a university abroad.

Programme curriculum[1]

The programme consists of mandatory specialisation courses totalling 60 credits in mathematical physics, quantum physics, computational physics, nanophysics, materials characterisation, physical electronics, surface physics and functional materials.

Additional options for individual specialisation are provided through elective courses in physics and engineering physics comprising 15 credits, as well as optional courses comprising 15 credits. Students should ensure that they have acquired the necessary information and consult the programme coordinators before making choices about these courses, as it may affect the nature of the degree the student intends to obtain. The programme concludes with a degree project in physics, 30 credits.

[1] Subject areas are indicated here. Courses included in the programme may have different titles.

Credit transfer

Students have the right to transfer credits from previously completed university courses in Sweden or abroad, subject to approval according to the current regulations.
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Additional information

The local regulations for first and second cycle education at Karlstad University stipulate the obligations and rights of students and staff.