

Education plan

for

Master's Programme in Physics
Masterprogram i fysik

120.0 Higher Education
Credits
120.0 ECTS credits

Programme code:	NFYSO
Valid from:	Autumn 2021
Date of approval:	2006-10-18
Changed:	2021-06-17
Department:	Department of Physics

Decision

This programme syllabus was approved by the Board of the Faculty of Science at Stockholm University on 2006-10-18 and revised on 2007-11-19, 2017-03-13 and 2021-06-17.

Prerequisites and special admittance requirements

To be admitted to the programme, knowledge equivalent to a Bachelor of Science degree is required, including at least 90 higher education credits in physics. Also required is knowledge equivalent to Swedish upper secondary course English B/English 6 or equivalent to one of the following tests: Cambridge CPE and CAE: Pass, IELTS: 6.0 (with no part of the test below 5.0), TOEFL (paper based): 550 (with minimum grade 4 on the written test part), TOEFL (computer based): 213, TOEFL (internet based): 79.

Programme structure

The programme consists of a compulsory part of 15 higher education credits (credits), an elective part of 30 to 37.5 credits, an optional part of 7.5 to 45 credits and a degree project of 30 to 60 credits.

Compulsory courses during the first year give advanced knowledge in modern experimental methodology, treatment of data and statistical methods. This knowledge is applied in elective and optional courses and in the degree project. The compulsory courses, aside the master thesis, make up for 15 credits. Knowledge in the field of physics is deepened and broadened thanks to groups of elective courses in theory, experimental techniques and applications. The acquired knowledge is finally applied on a specific problem during the master thesis project (30 to 60 credits). The elective courses give the possibility of a specialisation within at least one area of contemporary physics with corresponding research at the department and thus provide a good basis for future research studies in physics.

The knowledge and skills obtained during the programme are very useful for work related to data analysis, research and development in modern industry and other activities in society. The programme proposes four study paths within modern physics: i) Atomic, Molecular Physics and Optics, ii) Quantum Matter, iii) Particles and Cosmos and iv) General Physics. General Physics is a more open study path designed for students who wish to specialize in an area not covered by the other study paths or for students who, at the start of the programme, have not yet decided their area of specialization.

Goals

For a Degree of Master (Two Years) students must:

- demonstrate knowledge and understanding of physics, including both broad knowledge in physics and substantially deeper knowledge of certain areas of physics, together with deeper insight into current research

and development work;

- demonstrate deeper methodological knowledge in physics;
- demonstrate an ability to critically and systematically integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;
- demonstrate an ability to critically, independently and creatively identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work;
- demonstrate an ability to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts;
- demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts;
- demonstrate an ability to make assessments in the field of physics, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work;
- demonstrate insight into the potential and limitations of science, its role in society and people's responsibility for how it is used;
- demonstrate an ability to identify their need of further knowledge and to take responsibility for developing their knowledge.

Courses

Compulsory courses for all study paths, 15 credits:

- Programming and Computer Science for Physicists, AN, 7.5 credits (DA7011)*
- Statistical Methods in Physics, AN, 7.5 credits (FK7061)*

Master degree project for all study paths:

- Physics degree project, AN, 30 credits (FK9001)*, 45 credits (FK9002)* or 60 credits (FK9003)*

Elective experimental courses for all study paths, at least 7.5 credits among the following:

- Physical Measuring Techniques, AN, 7.5 credits (FK7063)*
- Detector Physics, AN, 7.5 credits (FK7056)*

Elective theoretical courses for all study paths, at least 7.5 credits among the following:

- Analytical Mechanics, AN, 7.5 credits, (FK7049)*
- Electrodynamics, AN, 7.5 credits, (FK7045)*
- Statistical Physics, AN, 7.5 credits, (FK7058)*

Elective broadening and deepening courses for the study path Atomic, Molecular Physics and Optics, at least 22.5 credits among the following:

- Advanced Quantum Mechanics, GN, 7.5 credits (FK5027)*
- Optics and Laser Physics, AN, 7.5 credits (FK7046)*
- Quantum Optics, AN 7.5 credits (FK7047)*
- Accelerator Physics, AN 7.5 credits (FK7055)*
- Atomic Physics, AN 7.5 credits (FK7057)*
- Molecular Physics, AN, 7.5 credits (FK7066)*
- Quantum Chemistry, 15 credits (FK7059)*
- Modern X-ray Science: Theory and Applications, 7.5 credits (FK7067)*

Elective broadening and deepening courses for the study path Quantum Matter, at least 22.5 credits among the following:

- Advanced Quantum Mechanics, GN, 7.5 credits (FK5027)*
- Optics and Laser Physics, AN, 7.5 credits (FK7046)*
- Quantum Optics, AN, 7.5 credits (FK7047)*
- Introduction to Quantum Information and Quantum Computation, AN, 7.5 credits (FK7052)*
- Superconductivity, AN, 7.5 credits (FK7053)*
- Nanoscale Technology, 7.5 credits (FK7054)*
- Condensed Matter Physics, AN, 7.5 credits (FK7060)*

Modern X-ray Science: Theory and Applications, 7.5 credits (FK7067)*

Elective broadening and deepening courses for the study path Particles and Cosmos, at least 22.5 credits among the following:

Advanced Quantum Mechanics, GN, 7.5 credits (FK5027)*
Cosmology and Particle Astrophysics, AN 7.5 credits (FK7050)*
Nuclear Physics AN, 7.5 credits (FK7051)*
Accelerator Physics, AN 7.5 credits (FK7055)*
Elementary Particle Physics, AN, 7.5 credits (FK7062)*
General relativity, AN 7.5 credits (FK8025)*

Elective broadening and deepening courses for the study path General Physics, at least 15 credits among the following:

Advanced Quantum Mechanics, GN, 7.5 credits (FK5027)*
Optics and Laser Physics, AN, 7.5 credits (FK7046)*
Quantum Optics, AN, 7.5 credits (FK7047)*
Cosmology and Particle Astrophysics, AN 7.5 credits (FK7050)*
Nuclear Physics AN, 7.5 credits (FK7051)*
Introduction to Quantum Information and Quantum Computation, AN, 7.5 credits (FK7052)*
Superconductivity, AN, 7.5 credits (FK7053)*
Nanoscale Technology, 7.5 credits (FK7054)*
Accelerator Physics, AN 7.5 credits (FK7055)*
Atomic Physics, AN 7.5 credits (FK7057)*
Quantum Chemistry, 15 credits (FK7059)*
Condensed Matter Physics, AN, 7.5 credits (FK7060)*
Elementary Particle Physics, AN, 7.5 credits (FK7062)*
Molecular Physics, AN, 7.5 credits (FK7066)*
Modern X-ray Science: Theory and Applications, 7.5 credits (FK7067)*
General relativity, AN 7.5 credits (FK8025)*

Optional courses:

Between 7.5 and 45 credits depending on the length of the master thesis project and the selected study path.

*Courses that are part of the main subject.

Degree

Master degree

Misc

For the master degree in physics it is required that the student has completed 120 credits, of which at least 75 credits should be advanced courses in physics.

The master degree can include a maximum of 30 credits from non-advanced courses.

Limitations described in individual course plans, as to whether an optional course can be incorporated into the master degree do apply. Introductory courses (orienteringskurser) cannot be included in the master degree.

Students who have been admitted to the programme but not completed it during the scheduled two years can request to complete the program even after the programme syllabus no longer applies. In such cases, the limitations stated in the course syllabus apply.

The faculty of Mathematics at Stockholm University contributes to the programme with one compulsory course.

The programme is given in English.