



## FACULTY OF SCIENCE

Programme sheet

# Master Programme in Computational Science, Physics, 120 credits

*September 2026 – June 2028*

**Computations are becoming more and more important in research and industry. To make predictions, analysis or to replace experiments, we make use of numerical simulations and machine learning on large computers. We generate and store large amounts of data and use data science to search for patterns, connections, and trends.**

The Master Programme in Computational Science with specialisation in Physics will give you detailed knowledge about the underlying methods with respect to physics. You will learn how to study complex processes in natural sciences, and how Computational Science can contribute to knowledge evolution in society. A few of many examples are studies in, and research on, environment and climate change, accelerator physics, cell dynamics and super novae. The programme will prepare you for a professional career in academia as well as in business and industry.

### Programme overview

This interdisciplinary education will give you foundational knowledge in the field of computational science. If you already have a bachelor's in physics, you will deepen your physics knowledge, especially in areas that require computational methods. You can also follow the programme without a previous bachelor's in physics – if so, you will get a broad overview of physics both at basic and advanced level that illustrates the interplay between computational methods and theoretical models.

In addition to knowledge in theory for computational science, there will be an emphasis on obtaining knowledge about the practical tools that are used by

professionals in the field and you will amongst several things train your skills in programming. You will get generic knowledge and skills of importance for computationally intensive working tasks, such as problem formulation, information search, data processing, scientific writing, and presentation techniques.

The programme has four separate specialisations: Geoscience, Life Sciences, Physics and Scientific Computing. You will study several courses together with students from another specialisation than your own and there will be opportunities to do common projects and thesis work. During your studies, an interdisciplinary perspective is emphasized and you will also study together with students from biology, geology, environmental sciences, physical geography and chemistry.

The education has a strong connection to research. You will meet and be taught by active and internationally well recognized researchers, and you will be in contact with several research groups. You will at the same time be prepared for a career in business and industry.

## Programme structure

Computational Physics is a branch within computational science where analytical, numerical and statistical methods are used to analyse and draw conclusions from physical models, as well as huge datasets from physics experiments. The programme contains a mix of courses in physics, mathematics and computational science that will give you broad knowledge in numerical methods within data science, Monte-Carlo simulations and solutions to differential equations. You will also get insight into the interplay between computational methods and the underlying physical phenomena and models that are studied.

### Compulsory courses 37.5 credits

<a href="#">BERN01</a>	Modelling in Computational Science 7.5 credits
<a href="#">FYSB22</a>	Basic Quantum Mechanics, 7.5 credits
<a href="#">FYSB23</a>	Basic Statistical Physics and Quantum Statistics, 7.5 credits
<a href="#">FYSB24</a>	Atomic and Molecular Physics, 7.5 credits
<a href="#">NUMN32</a>	Numerical Methods for Differential Equations, 7.5 credits

### Alternative-compulsory (elective) courses 22.5 credits

**One of the following courses:**

<a href="#">FYSC20</a>	Electromagnetism, 7.5 credits
<a href="#">FYSC22</a>	Nuclear Physics, 7.5 credits
<a href="#">FYSC24</a>	Particle Physics, Cosmology and Accelerators, 7.5 credits

**At least two of the following courses:**

<a href="#">BERN02</a>	Reproducible Data Science and Statistical Learning 7.5 credits
<a href="#">BERN04</a>	Introduction to Artificial Neural Networks and Deep Learning, 7.5 credits
<a href="#">BERN07</a>	Uncertainty Quantification and Data-driven Modeling, 7.5 credits
<a href="#">BERN09</a>	Parallel Programming in Computational Science, 7.5 credits
<a href="#">FYST85</a>	Quantum Computation, 7.5 credits
<a href="#">MASM11</a>	Monte Carlo Methods for Statistical Inference, 7.5 credits
<a href="#">NUMN21</a>	Advanced Course in Numerical Algorithms with Python/SciPy, 7.5 credits
<a href="#">NUMN28</a>	Numerical Simulations of Flow Problems, 7.5 credits
<a href="#">NUMN33</a>	Numerical Methods for Partial Differential Equations, 7.5 credits

**Optional courses 30 credits**

The optional courses should be selected so that the student among the compulsory, alternative-compulsory and optional courses study at least 30 credits advanced level physics and 30 credits advanced level in mathematical sciences (mathematics, numerical analysis, mathematical statistics).

For a student with a bachelor's in physics, the compulsory and alternative-compulsory courses in physics are covered by the student's pre-knowledge. The compulsory elements are then reduced to BERN01, Modelling in Computational Science, 7.5 credits, and NUMN32, Numerical Methods for Differential Equations, 7.5 credits. The extra available time for optional courses can be used to broaden the studies in advanced physics, or to specialize within, e.g., particle physics, atomic and molecular physics, solid state physics, nuclear physics, or theoretical physics.

**Degree project 30 credits**

<a href="#">BERM03</a>	Computational Science – Physics: Master's Degree Project
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**Table 1 Course of study for students without a bachelor's in physics, example**

<b>Year 1</b>	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>
	<b>BERN01</b> Modelling in Computational Science 7.5 credits	<b>FYSB22</b> Basic Quantum Mechanics, 7.5 credits	<b>FYSB23</b> Basic Statistical Physics and Quantum Statistics, 7.5 credits	<b>FYSC20</b> Electromagnetism, 7.5 credits
	<b>BERN02</b> Reproducible Data Science and Statistical Learning 7.5 credits	<b>NUMN32</b> Numerical Methods for Differential Equations, 7.5 credits	<b>FYSB24</b> Atomic and Molecular Physics, 7.5 credits	<b>NUMN28</b> Numerical Simulations of Flow Problems, 7.5 credits
<b>Year 2</b>	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>
	<b>FYST57</b> Chaos for Science and Technology, 7.5 credits	<b>BERN04</b> Introduction to Artificial Neural Networks and Deep Learning, 7.5 credits	<b>Degree Project 30 credits</b>	
	<b>FYSN17</b> Quantum Mechanics, 7.5 credits	<b>ASTM29</b> Statistical Tools in Astrophysics, 7.5 credits		

**Table 2 Course of study for students with a bachelor's in physics, example**

<b>Year 1</b>	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>
	<b>BERN01</b> Modelling in Computational Science 7.5 credits	<b>NUMN32</b> Numerical Methods for Differential Equations, 7.5 credits	<b>FYSN23</b> Advanced Electromagnetism, 7.5 credits	<b>NUMN28</b> Numerical Simulations of Flow Problems, 7.5 credits
	<b>MASC14</b> Stationary Stochastic Processes, 7.5 credits	<b>BERN04</b> Introduction to Artificial Neural Networks and Deep Learning, 7.5 credits	<b>MASM11</b> Monte Carlo Methods for Statistical Inference, 7.5 credits	<b>MASB21</b> Statistics – Basic Course for Applied Computational Science, 7.5 credits

Year 2	Autumn 1	Autumn 2	Spring 1	Spring 2
	FYST57 Chaos for Science and Technology, 7.5 credits	FYTN15 Statistical Mechanics, 7.5 credits	<b>Degree Project 30 credits</b>	
	FYSN17 Quantum Mechanics, 7.5 credits	Optional course in Computational Science or in Physics 7.5 credits		

## Career opportunities

After graduation, there are several different career paths depending on which subject profile you have chosen. The Master's programme gives you a solid ground for postgraduate education in natural sciences. You can also choose a career path outside academia and then find attractive jobs in areas where there is a need to solve computational problems both in industry and in public administration and other organisations.

## Requirements and selection

### Entry requirements

Bachelor's degree in Physics of at least 180 credits.

Proficiency in English equivalent to English 6/B from Swedish upper-secondary school.

**or**

Bachelor's degree of at least 180 credits in Science or Engineering. The degree should contain at least 30 credits mathematics, of which 6 credits in programming and 7.5 credits in statistics, and an additional 90 credits in mathematics and/or physics.

Proficiency in English equivalent to English 6/B from Swedish upper-secondary school.

### Selection criteria

Based on grades awarded for previous academic courses, with majors in science, technology and mathematics, as well as a statement of purpose for the

application in which applicants state their goals with the programme (from the applicant's "Summary sheet").

## Degree

### Master of Science

Major: Computational Science with specialisation in Physics

### Naturvetenskaplig masterexamen

Huvudområde: Beräkningsvetenskap med fördjupning i fysik

## Application

Apply online using [Universityadmissions.se](https://universityadmissions.se)

Application period: 16 October 2025 - 15 January 2026

Language of instruction: English

## Contact

Master coordinator: Patrik Edén [compsci@math.lu.se](mailto:compsci@math.lu.se)