Recommended plan of study

About the course

subject	Physics and Scientific Modelling
Recommended Study Plan	Read about the Master Programme and find the Study Regulations at ruc.dk If you have any questions regarding study planning, available courses etc. please contact the study administration at inm-exams@ruc.dk **List of courses/projects offered in the Autumn 2022** Recommended on first semester • Experiments and Models – Linear Response: Structure and Dynamics of Condensed Matter • Statistical Physics with Scientific Programming • Modelling Project Other available study activities • Specialisation Project **List of courses/projects offered in the Spring 2023** Mandatory course • Problem Solving in Physics I *please read transitional rules Other study activities (please find information regardring tracks and the programme's structure below) • Differential Equations in Models • Dynamical Systems Analysis • Scientific Computing and Data Science • Fundamental Mathematical Structures • Probability and Statistics • Biophysical Chemistry • Integrated Science • Quantum Mechanics *please read transitional rules • Specialisation Project • Modelling Project

Course days:

Hold: 1

Regarding elective courses and thematic profiles (click to read more)

time	01-02-2023 00:00 til 01-02-2023 00:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt

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Regarding elective courses and thematic profiles

Students can choose between the offered elective courses. The students also have the opportunity, as part of the elective courses, to choose between three thematic profiles, each consisting of four pre-appointed courses.

Thematic profile 1: Experimental and Computational Physics

- Scientific Computing and Data Science (10 ECTS)
- Differential Equations in Models (5 ECTS)
- Probability and Statistics (5 ECTS)
- Parameter Estimation (5 ECTS)

Thematic profile 2: Mathematical Foundation of Physics and Scientific Modelling

- Fundamental Mathematical Structures (10 ECTS)
- Dynamical Systems (5 ECTS)
- Probability and Statistics (5 ECTS)
- Differential Geometry (5 ECTS)

Thematic Profile 3: Experimental and computational biophysics

- Scientific Computing and Data Science (10 ECTS)
- Differential Equations in Models (5 ECTS)
- Biophysical Chemistry (5 ECTS)
- Proteomics and Metabolomics (ECTS)

The programme's structure (click to read more)

time	01-02-2023 00:00 til 01-02-2023 00:00
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Content

First semester

Objective

The objective of the first semester is that the student through exemplary work in a semester project and mini-project-based courses gets experience with and knowledge about the interplay between experiment, theory, models and numerical methods in physics and scientific modelling. The students will acquire both experimental and computational skills in the courses and the project can be tuned in a theoretical, experimental or computational direction depending on the students' interest.

Mandatory study activities

- Experiments and Models – Linear Response and Structure and Dynamics of Condensed Matter (10 ECTS)
- Statistical Physics with Scientific Programming (5 ECTS)
- Modelling Project (15 ECTS)

Second semester

Objective

The second semester is the profiling semester where the students start working with their thematic profile of choice or their individual profile. In addition, all students are introduced to problem solving in physics, which trains the students in tackling openly formulated problem, formulating it in terms of physics and mathematics, solving the problem and evaluating the solution.

In the thematic profile "Experiments and computational physics" the student will develop computational knowledge and numeric skills in scientific computing and data science as well as acquiring methods in statistics and probability theory.

In the thematic profile “Mathematical Foundation” the student will develop competences of the logical thinking and proofs furthermore the student will obtain knowledge of fundamental structures in mathematics within the course Fundamental Structures and acquire knowledge and methods of statistics and probability theory.

In the thematic profile “Experimental and computational biophysics” the student will develop computational knowledge and numeric skills in scientific computing and data science as well as applying the fundamental theories of physics in the context of biophysics and establish knowledge of a biochemical way of thinking and analysing a given problem.

General profile

Mandatory study activities (20 ECTS)

- Problem Solving in Physics I (5 ECTS)*
- Scientific Computing and Data Science (10 ECTS) or Fundamental Mathematical Structures (10 ECTS)
- Differential Equations in Models (5 ECTS) or Dynamical Systems Analysis (5 ECTS)

Elective study activities (the student must choose a total of 10 ECTS)

- Integrated Science (5 ECTS)
- Probability and Statistics (5 ECTS)
- Biophysical Chemistry (5 ECTS)

The student can also choose among the following courses if the courses do not already account for a mandatory course in the student’s programme:

- Scientific Computing and Data Science (10 ECTS)
- Fundamental Mathematical Structures (10 ECTS)
- Dynamical Systems Analysis (5 ECTS)

Each semester, the board of studies approves a number of courses for the students to choose from.

*Students who passed the Bachelor Subject Course in Problem Solving I - please look for the transitional rules

Third semester

Objective

In the third semester the students learn how to think like a physicist where the course problem solving in physics II serves as a culmination of the training in working with modelling in a problem-solving context using all the different sub-disciplines of physics. The students will learn to tackle an openly formulated problem, formulate it in terms of physics and mathematics, solving the problem and evaluating the solution. The semester also serves as a specialisation semester where students via the project and a profile/elective course develop their profile further either in a branch of physics or by broadening their scope by applying physics and scientific computing in other branches of science.

General profile

Mandatory study activities

- Problem Solving in Physics II (10 ECTS)
- Specialisation project or Project-oriented Internship (15 ECTS)

Elective study activities (5 ECTS)

- Parameter Estimation (5 ECTS)
- Differential Geometry (5 ECTS)
- Proteomics and Metabolomics (5 ECTS)
- Advanced Physics (5 ECTS)

Each semester, the board of studies approves a number of courses for the students to choose from.

Fourth semester - Master Thesis

Objective

The objective of the master thesis is that the student reaches the research front in a selected area within physics and/or scientific modelling, the mathematical foundation of physics and scientific modelling, or in another field where thinking as a physicist and/or scientific modelling plays a role in advancing the field. The goal is that the student makes independent methodological choices and conducts experimental, computational and/or analytical work to

solve a scientific problem. The master thesis also serves as the final specialisation of the student.

- Master Thesis (30 ECTS)

Transitional rules (click to read more)

time	01-02-2023 00:00 til 01-02-2023 00:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt

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Transitional rules

Students who have passed Problem Solving I (10 ECTS) during their Bachelor programme are not allowed to take the course Problem Solving in Physics I (5 ECTS).

The students must take Quantum Mechanics (10 ECTS) instead of Problem Solving in Physics I and one of the elective courses (5 ECTS).

Students who have completed a course in Quantum Mechanics during their bachelor programme are not allowed to follow Quantum Mechanics (10 ECTS).

Students who have completed a course in Electrodynamics during their bachelor programme are not allowed to follow Electrodynamics in Advanced Physics (5 ECTS).