

# Problem Solving in Physics I

Title                      Problem Solving in Physics I  
Semester                F2024  
Master programme in   Physics and Scientific Modelling

Type of activity        Course

Teaching language    English

Study regulation        Read about the Master Programme and find the Study Regulations at [ruc.dk](https://ruc.dk)  
Læs mere om uddannelsen og find din studieordning på [ruc.dk](https://ruc.dk)

## REGISTRATION AND STUDY ADMINISTRATIVE

Sign up for study activities at [stads selvbetjening](https://stads.selvbetjening.ruc.dk) within the announced registration period, as you can see on the [Studyadministration homepage](https://ruc.dk/studyadministration).

When signing up for study activities, please be aware of potential conflicts between study activities or exam dates.

### Registration

The planning of activities at Roskilde University is based on the recommended study programs which do not overlap. However, if you choose optional courses and/or study plans that goes beyond the recommended study programs, an overlap of lectures or exam dates may occur depending on which courses you choose.

Number of participants

ECTS                    5

Responsible for the activity    Martin Niss ([maniss@ruc.dk](mailto:maniss@ruc.dk))  
Nicholas Bailey ([nbailey@ruc.dk](mailto:nbailey@ruc.dk))

Head of study           Studieleder for Fysik ([fys-sl@ruc.dk](mailto:fys-sl@ruc.dk))

Teachers

Study administration       INM Registration & Exams ([inm-exams@ruc.dk](mailto:inm-exams@ruc.dk))

Exam code(s)          U60194

## ACADEMIC CONTENT

**Overall objective** The course Problem Solving in Physics will develop the students' skills and competences in recognising the difference between formalised and unformalized physics problems, formalising problems in terms of physics, solving these problems and evaluating the solutions. This is done by exemplary work within a series of the theory constructs of physics.

**Detailed description of content** The course Problem Solving in Physics 1 is intended to develop the student's skills and competencies in formalizing problems in physics, solving them and evaluating the solutions. This is done by exemplary work within a number of theory constructions of physics.

The course is centered on problem solving/assignment calculation, in which open-ended problems are taken from the general university physics syllabus and draw from topics such as classical mechanics, hydrodynamics, dimensional analysis, thermodynamics, and relativity theory.

**Course material and Reading list** Selected chapters from a general university physics textbook, currently Ohanian and Markert, "Physics for Scientists and Engineers". The book and chapters will be specified on Moodle prior to the start of the course.

These are supplemented with Lecture Notes on various topics to be distributed via Moodle.

135 hours in total (5 ECTS)

**Overall plan and expected work effort**

- 40 hours classroom teaching (lectures and problem solving)
- 30 hours preparation reading text book material
- 40 hours problem solving as preparation for class
- 25 hours problem solving as preparation for exam

**Format**

**Evaluation and feedback** The course includes formative evaluation based on dialogue between the students and the teacher(s).

Students are expected to provide constructive critique, feedback and viewpoints during the course if it is needed for the course to have better quality. Every other year at the end of the course, there will also be an evaluation through a questionnaire in SurveyXact. The Study Board will handle all evaluations along with any comments from the course responsible teacher.

Furthermore, students can, in accordance with RUCs 'feel free to state your views' strategy through their representatives at the study board, send evaluations, comments or insights from the course to the study board during or after the course.

Programme      The detailed program will consist of specific reading and specific problems to be solved in or outside the classroom and will be published on Moodle prior to the start of the course.

## ASSESSMENT

After completing the course the students will be able to

- Overall learning outcomes
- demonstrate knowledge and understanding of some of the theory constructs of physics, e.g., Classical Mechanics and Thermodynamics
  - determine and argue for which type of physics is in play in an unformalized problem in physics
  - distinguish between formalized and unformalized problems in physics
  - tackle an unformalized problem, formulating it in terms of physics and mathematics, solving the problem and evaluating the solution
  - "think like a physicist" within selected parts of physics.

Individual oral exam based on a portfolio.

Form of examination      The character limit of the portfolio is 1,200-120,000 characters, including spaces. Examples of written products are exercise responses, talking points for presentations, written feedback, reflections, written assignments. The preparation of the products may be subject to time

limits.

The character limits include the cover, table of contents, bibliography, figures and other illustrations, but exclude any appendices.

Time allowed for exam including time used for assessment: 15 minutes.

The assessment is an assessment of the oral examination. The written product(s) is not part of the assessment.

Permitted support and preparation materials for the oral exam: All.

Assessment: Pass/Fail.

Moderation: Internal co-assessor

Form of Re-examination

Samme som ordinær eksamen / same form as ordinary exam

Type of examination in special cases

The oral exam will be based on a portfolio which consists of the student's written responses to an assignment given during class time and involving several non-formalized physics problems. The physics content of these problems will be drawn from the material covering during the course.

The assessment criteria of the written part

Examination and assessment criteria

- demonstrate knowledge and understanding of some of the theory constructs of physics, e.g., Classical Mechanics and Thermodynamics
- determine and argue for which type of physics is in play in an unformalized problem in physics
- tackle an unformalized problem, formulating it in terms of physics and mathematics, solving the problem and evaluating the solution

-"think like a physicist" within selected parts of physics.

The assessment of the oral exam is based on the student's ability to meet the criteria mentioned above and their ability to

- clearly present and communicate the scientific content of the portfolio

- engage in a scientific dialogue and discussion with the assessor and co assessor

Furthermore, whether the performance meets all formal requirements in regard to both for the written og oral exam

Exam code(s) Exam code(s) : U60194

## Course days:

**Hold: 1**

### Problem Solving in Physics I (PSM)

time	09-02-2024 08:15 til 09-02-2024 10:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-046 - fysik b (1)
Teacher	Martin Niss ( maniss@ruc.dk ) Nicholas Bailey ( nbailey@ruc.dk )

### Problem Solving in Physics I (PSM)

time	19-02-2024 10:15 til 19-02-2024 14:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-046 - fysik b (1)
Teacher	Martin Niss ( maniss@ruc.dk ) Nicholas Bailey ( nbailey@ruc.dk )

### Problem Solving in Physics I (PSM)

time	23-02-2024 08:15 til 23-02-2024 10:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt

location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 26-02-2024 11:00 til  
26-02-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 01-03-2024 08:15 til  
01-03-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 04-03-2024 11:00 til  
04-03-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 08-03-2024 08:15 til  
08-03-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)

Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 11-03-2024 11:00 til  
11-03-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 15-03-2024 08:15 til  
15-03-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 18-03-2024 11:00 til  
18-03-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 22-03-2024 08:15 til  
22-03-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)

Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 25-03-2024 10:15 til  
25-03-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 05-04-2024 08:15 til  
05-04-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 12-04-2024 08:15 til  
12-04-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 15-04-2024 11:00 til  
15-04-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)



Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 19-04-2024 08:15 til  
19-04-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 22-04-2024 11:00 til  
22-04-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 29-04-2024 10:15 til  
29-04-2024 14:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I (PSM)**

time 02-05-2024 08:15 til  
02-05-2024 12:15  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)

Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I - Hand-in (PSM)**

time 02-05-2024 13:00 til  
02-05-2024 13:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt

### **Problem Solving in Physics I - Exam (PSM)**

time 13-05-2024 13:00 til  
13-05-2024 13:35  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )

### **Problem Solving in Physics I - Hand-in of portfolio (reexam) (PSM)**

time 28-06-2024 10:00 til  
28-06-2024 10:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt

### **Problem Solving in Physics I - Reexam (PSM)**

time 15-08-2024 08:15 til  
15-08-2024 16:00  
forberedelsesnorm ikke valgt  
forberedelsesnorm D-VIP ikke valgt  
location 27.2-046 - fysik b (1)  
Teacher Martin Niss ( maniss@ruc.dk )  
Nicholas Bailey ( nbailey@ruc.dk )