

Quantum Mechanics

Title	Quantum Mechanics
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

Læs mere om uddannelsen og find din studieordning på 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 10

Responsible for the activity

Dorthe Posselt (dorthe@ruc.dk)

Head of study Studieleder for Fysik (fys-sl@ruc.dk)

Teachers

Study administration INM Registration & Exams (inm-exams@ruc.dk)

Exam code(s) U60047

ACADEMIC CONTENT

The course is offered for a short period of time and only to students who have passed the Bachelor Course in Problem Solving I.

Overall objective	Quantum mechanics is treated as a self-consistent theoretical foundation in physics. Emphasis is placed on the student's acquisition of an in-depth understanding of, and practice in, problem solving within quantum mechanics, as well as an insight into different interpretations of quantum mechanics. Quantum mechanics may be the most profound revolution in our understanding of the physical world and is in addition forming the basis for the development of technological milestones such as the laser and the semiconductor.
Detailed description of content	The course aims at giving students a working knowledge of the quantum mechanical formalism which may appear strange and very abstract, but leads to quantitative predictions of e.g. the optical emission spectrum of atomic hydrogen. The introduction to the course is a historic and philosophical overview, while the main part of the course introduces the Schrödinger equation and solve the equation for different simple (model) cases. The quantum mechanical formalism is developed and finally the Schrödinger equation is solved for a real case: the hydrogen atom. The main emphasis in the course is on an intrinsic understanding of the formalism and application of the formalism to solve simple quantum mechanical problems.
Course material and Reading list	The course follows a text book, fx Introduction to Quantum Mechanics by David J. Griffiths and Darrell F. Schroeter. (Details will be specified on Moodle). Additional material is uploaded to Moodle.
Overall plan and expected work effort	The course will be planned as a mixture of lectures and solving of problems (pen and paper) including discussions of problems. In addition the students will work with solving quantum mechanical problems numerically.

Quantum Mechanics 10 ECTS = 270h. Contact hours: 36+36+12=84 h

- Lectures 36 h
- Preparation for lectures 72 h
- Problem solving 36 h (in class)
- Preparation for problem solving 72 h
- Mini projects 12+12=24 h (12 in class, 12 independent work)
- Preparation for exam 26 h
- Exam 4h

Format

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

Evaluation and feedback 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 course will be planned as a mixture of lectures and solving of problems (analytically and numerically) including discussions of problems.

Class by Class program will be posted on Moodle during the course.

ASSESSMENT

Overall learning outcomes

After completing the course the students will be able to

- in-depth knowledge and understanding of quantum mechanics, seen as a self-consistent theoretical foundation in physics
- knowledge and understanding of different interpretations of quantum mechanics
- proficiency in solving problems and tasks relevant in quantum mechanics
- proficiency in applying a variety of frequently used mathematical methods in quantum mechanics
- competences in assessing the relevance of applying quantum mechanics to a given physical research question
- competences in determining which method(s) can be applied in solving a given research question in quantum mechanics.

Individual written invigilated exam

The duration of the exam is 5 hours.

Form of examination Permitted support and preparation materials for the exam: A formulae collection of max. one A4 size page (both sides of the paper may be used) made by the student.

Form of Re-examination Assessment: 7-point grading scale
 Type of examination Samme som ordinær eksamen / same form as ordinary exam
 in special cases
 cases

Examination and assessment criteria The exam consist of a set of problems.
 The assessment is based on the student's skill to

- in-depth knowledge and understanding of quantum mechanics, seen as a self-consistent theoretical foundation in physics

- proficiency in solving problems and tasks relevant in quantum mechanics
- proficiency in applying a variety of frequently used mathematical methods in quantum mechanics

Exam code(s) Exam code(s) : U60047

Course days:

Hold: 1

Quantum Mechanics (PSM)

time	02-02-2024 12:15 til 02-02-2024 16:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.1-052 - lokale 2 (20)
Teacher	Dorthe Posselt (dorthe@ruc.dk)

Quantum Mechanics (PSM)

time	05-02-2024 08:15 til 05-02-2024 12:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.1-040 - fysiksamlingen (1)
Teacher	Dorthe Posselt (dorthe@ruc.dk)

Quantum Mechanics (PSM)

time	06-02-2024 12:15 til 06-02-2024 14:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.1-040 - fysiksamlingen (1)
Teacher	Dorthe Posselt (dorthe@ruc.dk)

Quantum Mechanics (PSM)

time 09-02-2024 08:15 til
09-02-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 12-02-2024 12:15 til
12-02-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 13-02-2024 12:15 til
13-02-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.2-054 - lokale 3 (40)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 16-02-2024 08:15 til
16-02-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 19-02-2024 12:15 til
19-02-2024 16:00
forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 20-02-2024 12:15 til
20-02-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.2-054 - lokale 3 (40)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 23-02-2024 08:15 til
23-02-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 26-02-2024 12:15 til
26-02-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 27-02-2024 12:15 til
27-02-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 01-03-2024 08:15 til
01-03-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 04-03-2024 12:15 til
04-03-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 07-03-2024 08:15 til
07-03-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 11-03-2024 12:15 til
11-03-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 14-03-2024 08:15 til
14-03-2024 10:00
forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 18-03-2024 12:15 til
18-03-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 21-03-2024 08:15 til
21-03-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 25-03-2024 12:15 til
25-03-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 04-04-2024 08:15 til
04-04-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 08-04-2024 12:15 til
08-04-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 11-04-2024 08:15 til
11-04-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 15-04-2024 12:15 til
15-04-2024 16:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 18-04-2024 08:15 til
18-04-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 22-04-2024 12:15 til
22-04-2024 16:00
forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 25-04-2024 08:15 til
25-04-2024 10:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-052 - lokale 2 (20)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 30-04-2024 12:15 til
30-04-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 02-05-2024 10:15 til
02-05-2024 12:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 07-05-2024 12:15 til
07-05-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorthе@ruc.dk)

Quantum Mechanics (PSM)

time 14-05-2024 12:15 til
14-05-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 16-05-2024 10:15 til
16-05-2024 12:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 21-05-2024 12:15 til
21-05-2024 14:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics (PSM)

time 23-05-2024 10:15 til
23-05-2024 12:00
forberedelsesnorm ikke valgt
forberedelsesnorm D-VIP ikke valgt
location 27.1-040 - fysiksamlingen (1)
Teacher Dorthe Posselt (dorte@ruc.dk)

Quantum Mechanics - Exam (PSM)

time 11-06-2024 09:00 til
11-06-2024 14:00
location 27.2-054 - lokale 3 (40)

Quantum Mechanics - Reexam (PSM)

time	15-08-2024 09:00 til 15-08-2024 14:00
forberedelsesnorm	ikke valgt
forberedelsesnorm D-VIP	ikke valgt
location	27.2-064 - pc lokale (40)