



Course syllabus

Faculty of Technology

Department of Physics and Electrical Engineering

4FY588 Avancerad kvantmekanik, 7,5 högskolepoäng

Advanced quantum mechanics, 7.5 credits

Main field of study

Physics

Subject Group

Physics

Level of classification

Second Level

Progression

A1N

Date of Ratification

Approved 2015-05-22

Revised 2021-11-17 by Faculty of Technology. Changed the old codes in the prerequisites.

The course syllabus is valid from autumn semester 2022

Prerequisites

Physics 90 hp, mathematics 45 hp. A course in Quantum mechanics II, 4FY519 or equivalent. English B or equivalent.

Objectives

After taking this course the student is expected to have acquired:

- a thorough knowledge of the time dependent Schrödinger equation and its solution in different time regimes (perturbative, adiabatic and sudden change).
- an introduction of scattering theory with applications in atomic, solid state and nuclear physics
- fundamental notions of ensemble of identical particles in quantum mechanics (fermions and bosons) and elements of second quantization.
- knowledge of the Klein-Gordon and Dirac equations and their solutions for simple potentials, together with an understanding of the need of going beyond relativistic quantum mechanics, and elements of relativistic quantum field theory
- improved skills in solving problems (analytically and numerically) in all the topics of the course.

Content

This course is an advanced course in quantum mechanics, and requires previous knowledge of the subject.

1. Review of time-dependent problems in quantum mechanics
2. Scattering theory
3. Identical particles
4. Relativistic quantum mechanics
5. Introduction to quantum field theory

Type of Instruction

The teaching consists of lectures and tutorials.

Students can also register for the “distance” version of the course and follow the course via the internet. IT support and technical information: Email and real-time web connection. Recorded lectures on course homepage.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

Assessment of student performance is made through written test and oral examinations and presentation of mandatory assignments.

A second examination will be offered within six weeks under the regular semester periods.

Course Evaluation

During the course or in close connection to the course, a course evaluation is to be carried out. The result and analysis of the course evaluation are to be communicated to the students who have taken the course and to the students who are to participate in the course the next time it is offered. The course evaluation is carried out anonymously. The compiled report will be filed at the Faculty.

Credit Overlap

The course cannot be included in a degree along with the following courses of which the content fully, or partly, corresponds to the content of this course: 4FY888 Advanced quantum mechanics, 7.5 credits

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

Required Reading and Additional Study Material

Reference literature

- Sakuraj, JJ & Napolitano, Jim, Modern Quantum Mechanics, Pearson Education (2011), 570 pages. ISBN 978080538291-4
- Bransden, B.H. & Joachain, C.J., Quantum Mechanics, (Second Edition), Benjamin Cummings; (2000). 803 (820) pages. ISBN10: 0582356911
- Class notes are provided by the Teacher.