



FSH3314 Non-Hermitian Quantum Mechanics 7.5 credits

Icke-Hermitesk kvantmekanik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSH3314 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Admitted to PhD studies in Physics, Biological Physics, or related fields of study.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The main aim of the course is to understand the basic concepts in scattering theory and non-Hermitian quantum dynamics. On completion of the course, the students will be able to apply the theory of quantum scattering for particles in a spherically symmetric potential. They should acquire knowledge about resonances, continuum as well as bound and anti-bound states in the complex energy plane of quantum mechanics. The students will be able to describe the resonances and unbound states in atomic, molecular, nuclear and hadron physics. They should also be able to analyze quantum scattering and transport by complex potentials. The students are also expected to be able to apply the theory to analyze the decay properties of unstable and open quantum systems, for example the charged-particle decays from atomic nucleus. They will also be able to describe the halo properties in exotic nuclei and certain reaction processes in nuclear astrophysics.

Course contents

Scattering and phase shift

Resonance

Gamow penetration and proton, alpha and cluster decays

Continuum

Complex energy plane

Antibound state and nuclear halo

Resonance in relativistic systems

Disposition

Lecture notes will be distributed and the students are expected to study mostly by themselves. Discussions and lectures will be arranged together with the students.

Course literature

D.S. Belkic, The principles of Quantum scattering theory, Stockholms University and lecture notes.

Examination

- SEM1 - Seminars, 7.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

To pass the course the students should give 1-2 open seminars on the subject and hand in a study report. In both cases the students should demonstrate that they have obtained good understanding of the subject and be able to apply their knowledge to practical problems and answer the questions and comments raised by the teacher and other students in a proper way.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.