

Relativistic Quantum Mechanics

Programme course

6 credits

Relativistisk kvantmekanik

TFYA57

Valid from:

Determined by

Date determined

Replaced by

TFYTo6

Main field of study

Applied Physics, Physics

Course level

Second cycle

Advancement level

A1X

Course offered for

- Applied Physics and Electrical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Physics and Nanoscience, Master's programme

Specific information

The course is given every second year. it will be offered during 2015

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Classical Electrodynamics, Analytical mechanics, Quantum mechanics.

Intended learning outcomes

The purpose of the course is to introduce students into relativistic quantum theory, emphasizing its important applications in condensed matter physics. After having passed the examination the students should have obtained such knowledge that the ability to understand research literature using relativistic quantum mechanical language is essentially increased. After finishing the course the students know:

- foundations of modern first-principles theories based on relativistic quantum mechanics
- foundations of scattering theory
- how to solve relativistic quantum mechanics problems that involve topics listed in the course content

Course content

Basic theory, including special relativity and angular momentum. Dirac equation, symmetries and operators, and free particles. Physical consequences of solutions, model problems. Important applications of quantum theory to condensed matter. Relevant theory for the one-electron atom. Development of the theory to describe the quantum mechanics of many electron systems, including Hartree-Fock and density functional methods. Scattering theory and band structures.

Teaching and working methods

The course is given as lectures.

Examination

UPG1 Homework problems and oral presentation 6 credits U, 3, 4, 5

Grades

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Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Johansson

Examiner

Sergei Simak

Course website and other links

<http://www.ifm.liu.se/undergrad/fysikgtu/coursepage.html?selection=all&sort=kk>

Education components

Preliminary scheduled hours: 48 h

Recommended self-study hours: 112 h

Course literature

"Relativistic Quantum Mechanics", Paul Strange