



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Kvantmekanik, fortsättningskurs 2 Quantum Mechanics, Advanced Course 2

FMFN10, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED F/Pi

Date of Decision: 2023-04-18

General Information

Elective for: F4, F4-tf, N4

Language of instruction: The course will be given in English

Aim

The course should give the student an ability to perform calculations and derivations using a modern quantum mechanical formalism, especially in vector spaces with continuous eigenvalue spectra. The student should also achieve an improved ability to assimilate the contents of research articles in modern physics and be able to apply the formalism on concrete physical problems.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- have a knowledge and understanding of the basic foundations of modern quantum mechanics
- understand the possibilities and limitations of quantum mechanics
- be able to choose and carry through a quantum mechanical analysis to solve or illuminate some physical question

Competences and skills

For a passing grade the student must

- be able to derive quantum mechanical relations and solve physical problems using a modern quantum mechanical formalism

Contents

- Fundamental concepts and quantum dynamics.
- Theory of Angular momentum, the groups $SO(3)$ and $SU(2)$, Euler rotations, representations of the rotation operator, addition of angular momenta, Bell's inequality, tensor operators, Wigner-Eckart theorem.
- Symmetries in quantum mechanics: Parity, lattice translations, time-reversal.
- Approximation methods: Interaction picture, time-dependent perturbation theory.
- Many-particle theory and second quantization: identical particles, bosons, fermions, field operators.
- Scattering theory: Lippmann-Schwinger equation, Born approximation, optical theorem, partial waves.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written and oral exam with both problems and theory. The grading will be determined from the exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: FMFN01 Quantum Mechanics, Advanced Course 1.

The number of participants is limited to: No

Reading list

- Sakurai, J.J., Modern Quantum Mechanics, Addison-Wesley Publ. Company, 1994, ISBN: 0-201-53929-2.

Contact and other information

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Course homepage: <http://www.matfys.lth.se>