Linnæus University

Jnr: 2014/3271-3.1.2

Course syllabus

Committee for First and Second Cycle under the Faculty Board of Healt, Social Work and Behavioural Sciences

Department of Physics and Electrical Engineering

4FY519 Kvantmekanik II, 7,5 högskolepoäng
Quantum mechanics II, 7.5 credits

Main field of study
Physics

Subject Group
Physics

Level of classification
Second Level

Progression
A1N

Date of Ratification
Approved by Faculty of Technology 2014-10-03
The course syllabus is valid from autumn semester 2015

Prerequisites
Physics 90 credits, mathematics 45 credits

Objectives

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

- an in-depth understanding of quantum mechanics, including the conceptual formulation of quantum theory with the use of Dirac's formalism
- knowledge of advanced theoretical methods (e.g. the theory of symmetry, Feynman's propagator and path integral) applied to quantum systems
- the skill of using theoretical and mathematical methods to build models and to solve advanced problems in quantum mechanics, with emphasis on perturbative techniques
- an advanced understanding of the theory of angular momentum, including angular momentum addition and tensor operators
- a knowledge of how to deal with time-dependent problems in quantum mechanics in different regimes
- an introduction of quantum systems of (many) identical particles.

Content

Course content:

- Dirac's formalism and the general formulation of quantum mechanics
- Quantum dynamics, semi-classical approximations, propagators and Feynman's path integral

- Time-independent perturbation theory
- General theory of angular momentum
- Symmetry in quantum mechanics: conservation laws and degeneracies
- Time-dependent problems: perturbation theory, the sudden approximation, the adiabatic approximation and the Berry phase
- Many-particle systems, identical particles

Type of Instruction
The teaching consists of lectures and/or tutoring, problem-solving sessions and computer-simulation labs. Attendance of the problem-solving sessions and computer simulations labs is mandatory.

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 the student performance is made through written test and/or oral examinations and/or presentation of mandatory assignments. The main form of examination is determined at the start of the course.

Course Evaluation
A course evaluation will be carried out and compiled after the course is completed. The compilation will be presented to the current board as well as to the students and filed by the coordinating department.

Credit Overlap
This course cannot be part of a degree in combination with another course in which the content fully or partly correspond to the content of this course: 4FY819 Quantum mechanics II, 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
Required reading
Sakurai, J.J. & Napolitano, Jim, (2011). Modern Quantum Mechanics, 2nd edition, Pearson Education; ISBN:978080538291-4

Additional reading

Bransden, B.H. & Joachain, C.J. (2000), Quantum Mechanics, 2nd edition, Benjamin Cummings; ISBN-10: 0582356911