Technology
Arts Sciences
TH Köln

Course
QM - Quantum mechanics

Version: 1 | Last Change: 29.09.2019 18:39 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

General information

Long name	Quantum mechanics
Approving CModule	QM_MaET
Responsible	Prof. Dr. Uwe Oberheide Professor Fakultät IME
Level	Master
Semester in the year	winter semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Uwe Oberheide Professor Fakultät IME
Requirements	In-depth knowledge of mathematics (integral calculus, differential calculus, vector geometry) Basic knowledge of physics (oscillations and waves, double slit, interference, thermodynamics, potential / kinetic energy) Basic knowledge of electrical engineering (magnetic and electric fields, components)
Language	German
Separate final exam	Yes

Final exam

Details

Testing the taxonomy levels of understanding and applying by describing the elementary quantum mechanical processes and their differentiation from the classical physical representation.

Testing the taxonomy level analyzing on the basis of real applications and tracing back the quantum mechanical processes involved

Minimum standard

50 % of the questions correctly answered

Exam Type

Testing the taxonomy levels of understanding and applying by describing the elementary quantum mechanical processes and their differentiation from the classical physical representation.
Testing the taxonomy level analyzing on the basis of real applications and tracing back the quantum mechanical processes involved

Lecture

Learning goals

Knowledge

The failure of classical physics (black spot, photoelectric effect, Compton effect, Stern-Gerlach experiment, Bohr's atom model, matter waves)
Quantum behaviour (experiments with spheres, waves and electrons; basic principles of quantum mechanics; principle of indeterminacy; laws of combination of amplitudes; identical particles)
Schrödinger equation (development of the wave equation; stationary, time-dependent)
simple potential problems (infinitely deep potential pot, finitely deep potential pot, potential stage, potential barrier, harmonic oscillator, hydrogen atom)
Basic principles of quantum computers and quantum cryptography

Skills

Description of given physical problems mathematically by listing the Schrödinger equation and applying of methods to solve the differential equations (separation approaches, limit value considerations)
To evaluate physical solutions and select them by analogy
Analyzing quantum effects and transferring them to technical applications

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	3
Tutorial (voluntary)	0

Separate exam

none

Seminar

Learning goals

Knowledge

Discourse on quantum mechanical processes (uncertainty principle, wave-particle dualism, wave functions/packages) and their applications in real systems in the context of the course

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Seminar	1
Tutorial (voluntary)	0

Separate exam

none