GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2018-2019

Quantum Mechanics 2 (C002245)

Course size (nominal values; actual values may depend on programme)

Credits	6.0	Study time	180 h
Contact hrs	52.5 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	lecture	30.0 h
		seminar: coached exercises	22.5 h

Lecturers in academic year 2018-2019

Verschelde, Henri	WE05	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Science in Physics and Astronomy	6	A
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Quantum mechanics Theoretical Physics

Position of the course

To familiarize the students with the concepts, laws and ways of thinking of chemical thermodynamics and with the applications to phase transitions and chemical reactions. To provide insight into the molecular background of thermodynamic concepts. To discuss the various aspects of the problem of reaction rate. To demonstrate how rate equations are deduced from experimental data and how rate equations and reaction mechanisms are related. To explain and evaluate the theories on reaction rates which are currently used.

Contents

Spherical harmonics and the hydrogen atom.
Axiomatic approach to quantum mechanics using electron spin.
The measurement problem and entanglement.
Quantum computing.
Symmetry in quantum mechanics: translation and rotation symmetry.
The three dimensional Schrödinger equation: central potential and particle in an electromagnetic field.
Scattering theory and partial wave analysis of potential scattering.
Approximation methods in quantum mechanics: time dependent perturbation theory (interaction picture), semiclassical approximation (WKB) and variational methods.
Introduction to relativistic quantum mechanics: Klein Gordon - and Dirac equation, Lorentz invariance, spinors.
Free relativistic particle.
Hawking radiation of black holes.

Initial competences

Basic knowledge of mathematical analysis and linear algebra is sufficient.

Final competences

1 The student can apply advanced mathematical methods to other areas, in particular to quantum mechanical problems.
2 The student has a thorough understanding of the mathematical and physical principles of quantum mechanics.
3 The student can communicate this insight in a structured way and has a critical and scientific attitude towards the insights he/she has gained.

4 The student can apply his insight and knowledge when analysing and solving problems.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

ICT: we plan a site where info on theory and exercises can be found

Learning materials and price

syllabus (in Dutch) available via Minerva.

References

J. Björken & S. Drell: Relativistic Quantum Mechanics, McGraw-Hill (1964).
L. Landau & E. Lifschitz: Quantum Mechanics, Pergamon (1965).
A. Messiah: Mécanique Quantique, Dunod (1960).

Course content-related study coaching

There is possibility for consulting the teacher and assisting personel. Electronic means of consultation are being planned for the future but personal contact will remain the main form of study coaching

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, oral examination

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

Theory : oral with written preparation, closed book
Exercises : written, open book

Calculation of the examination mark

1/2(theory)+1/4(oral)+1/4(exercises)