

## Quantum Mechanics I (E023010)

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

**Credits 6.0**

**Study time 180 h**

**Course offerings and teaching methods in academic year 2025-2026**

A (semester 2)

Dutch

Gent

lecture

**Lecturers in academic year 2025-2026**

Vanduyfhuys, Louis

TW17

lecturer-in-charge

Rogge, Sven

TW17

co-lecturer

**Offered in the following programmes in 2025-2026**

[Bachelor of Science in Engineering\(main subject Engineering Physics\)](#)

**crdts**

**offering**

6

A

[Bridging Programme Master of Science in Engineering Physics](#)

6

A

[Preparatory Course European Master of Science in Nuclear Fusion and Engineering Physics](#)

6

A

[Preparatory Course Master of Science in Engineering Physics](#)

6

A

**Teaching languages**

Dutch

**Keywords**

Theory of Relativity, Quantum Physics

**Position of the course**

This course can be considered as an introduction to the traditional "Modern Physics" course. A short treatment of Einstein's special theory of relativity is given. Special attention goes to the experimental basis of Quantum Physics, emphasizing the limits of the classical physics and the introduction of Quantum Mechanics. The postulates are introduced among with the time dependent Schrödinger Equation. In this lecture, applications are restricted one dimensional problems. More formal mathematical aspects of quantum theory are discussed as an introduction to the follow-up course "Quantum Mechanics II".

**Contents**

- Introduction to relativity theory: Light in moving frames of reference, The Lorentz transform, Relativistic dynamics, Applications
- Experimental basis of quantum mechanics: Photons, The photo-electric effect, Compton effect, Electron diffraction - De Broglie waves, Bohr's atom model, Wave-particle duality
- Wave function and wave packet - The Uncertainty Relation: Heisenberg's gamma ray microscope, two-slot experiment, free particle
- The Schrodinger equation: Schrodinger equation for free particle, Schrodinger equation for particle in external potential, One-dimensional applications
- The state space: Operators in quantum mechanics
- Postulates: Formulation of postulates, Heisenberg's Uncertainty Relation, Quantum Dynamics, Description in various images
- One-dimensional linear harmonic oscillator: eigen values and eigen states

**Initial competences**

Physics I and II

**Final competences**

- 1 Explaining quantisation of observables and the postulates of quantum mechanics.

- 2 Explaining and elucidating wave-particle duality.
- 3 Describing and applying the operator concept in quantum mechanics.
- 4 Having developed a scientific curiosity for quantum mechanics and its applications.

**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

**Extra information on the teaching methods**

Classroom lectures; Classroom problem solving sessions

**Study material**

Type: Syllabus

Name: Syllabus Quantum Mechanics 1

Indicative price: € 10

Optional: yes

Language : Dutch

Number of Pages : 255

Available on Ufora : No

Online Available : No

Available in the Library : No

Available through Student Association : No

Additional information: The course material for the course Quantum Mechanics 1 consists of a syllabus and slides. The slides will be uploaded to Ufora during the academic year and we offer the opportunity to buy the syllabus.

Type: Slides

Name: Slides Quantum Mechanics 1

Indicative price: Free or paid by faculty

Optional: no

Language : Dutch

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

**References**

- B.H. Bransden and G.J. Joachain: Introduction to Quantum Mechanics - Longman 1989.
- F.S. Levin: An Introduction to Quantum Theory - Cambridge Univ. Press 2002.

**Course content-related study coaching****Assessment moments**

end-of-term assessment

**Examination methods in case of periodic assessment during the first examination period**

Written assessment

**Examination methods in case of periodic assessment during the second examination period**

Written assessment

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

not applicable

**Extra information on the examination methods**

During examination period: written closed-book exam

**Calculation of the examination mark**

Evaluation during examination period

