

INFORMATIONS

Contact

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Class schedule

5 lectures (3 h each): <https://ernest.unistra.fr/>

Textbook

- D.J. Griffiths, *Introduction to Quantum Mechanics* (Cambridge University Press, 2018)

Bibliography

- C. Cohen-Tannoudji, B. Diu, F. Laloë, *Quantum Mechanics, Vol. 1* (Wiley-VCH, 2020)
- W. Greiner, *Quantum Mechanics – An Introduction* (Springer, 1989)
- L.D. Landau, E.M. Lifshitz, *Quantum Mechanics* (Pergamon Press, 1965)
- E. Merzbacher, *Quantum Mechanics* (Wiley & Sons, 1998)
- M. Le Bellac, *Quantum Physics* (Cambridge University Press, 2013)
- J.J. Sakurai, *Modern Quantum Mechanics* (Addison-Wesley, 1985)
- F. Schwable, *Quantum Mechanics* (Springer, 2007)
- R. Shankar, *Principles of Quantum Mechanics* (Springer, 1994)

Course outline

1. The wave function

- 1.1 The Schrödinger equation
- 1.2 The statistical interpretation
- 1.3 Normalization
- 1.4 Momentum
- 1.5 The uncertainty principle

2. Time-independent Schrödinger equation

- 2.1 Stationary states
- 2.2 The infinite square well
- 2.3 The harmonic oscillator

3. Formalism

- 3.1 Hilbert space
- 3.2 Observables
 - 3.2.1 Hermitian operators
 - 3.2.2 Determinate states
- 3.3 Eigenfunctions of a Hermitian operator
 - 3.3.1 Discrete spectra
 - 3.3.2 Continuous spectra
- 3.4 Generalized statistical interpretation
- 3.5 The uncertainty principle
 - 3.5.1 Proof of the generalized uncertainty principle
 - 3.5.2 The energy-time uncertainty principle
- 3.6 Dirac notation

4. Quantum mechanics in three dimensions

- 4.1 Schrödinger equation in spherical coordinate
 - 4.1.1 Separation of variables
 - 4.1.2 The angular equation
 - 4.1.3 The radial equation
- 4.2 The hydrogen atom