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)
- D. Tong, *Quantum Mechanics* (Cambridge University Press, 2025)
  see also David Tong's lecture notes (University of Cambridge)

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