

Reading assignments

Preliminary background material

Our Quantum course does not require any prior studies of Physics. However, we do suggest reading selected chapters from the Feynman Lectures on Physics to familiarise yourself with the basic notions of classical physics that are relevant for our Quantum course. This background material will help you to put our course material into broader context. It's probably best to study it as early in the course as possible, but you may also find it useful to skim through it and then come back later during the course.

Mechanics

- Feynman vol 1, Chapter 4 "*Conservation of Energy*" https://www.feynmanlectures.caltech.edu/I_04.html
- Feynman vol 1, Chapter 9 "*Newton's Laws of Dynamics*" https://www.feynmanlectures.caltech.edu/I_09.htm
- Feynman vol 1, Chapter 21 "*The Harmonic Oscillator*" https://www.feynmanlectures.caltech.edu/I_21.html
- Feynman vol 1, Chapter 23 "*Resonance*" https://www.feynmanlectures.caltech.edu/I_23.html

[Note: working out through the math in chapters 21 & 23 is a good refresh your differential equations training]

Radiation

- Feynman vol 1, Chapter 28 "*Electromagnetic Radiation*" https://www.feynmanlectures.caltech.edu/I_28.html
- Feynman vol 1, Chapter 29 "*Interference*" https://www.feynmanlectures.caltech.edu/I_29.html
- Feynman vol 1, Chapter 32 "*Radiation damping*" https://www.feynmanlectures.caltech.edu/I_32.html

[Note: parts of these chapters contains formulas and language that may seem complicated to a beginner reader. Feel free to skip the math and try capturing the basics]

Statistical mechanics

- Feynman vol 1, Chapter 6 "*Probability*" https://www.feynmanlectures.caltech.edu/I_06.html
- Feynman vol 1, Chapter 41 "*The Brownian Motion*" https://www.feynmanlectures.caltech.edu/I_41.html

Introduction to introduction to quantum mechanics (week 1-2)

- Feynman vol 3, Chapter 1 "*Quantum Behavior*"
- Feynman vol 3, Chapter 2 "*The Relation of Wave and Particle Viewpoints*"
- Susskind & Friedman, "**Quantum Mechanics: The Theoretical Minimum**" Chapter 1

the book is available for a low cost at Galaxus and similar shops:

<https://www.galaxus.ch/en/s12/product/quantum-mechanics-the-theoretical-minimum-leonard-susskind-english-non-fiction-13124696>

also, see free lectures on youtube

<https://theoreticalminimum.com/courses/quantum-mechanics/2012/winter/lecture-1>

<https://theoreticalminimum.com/courses/quantum-mechanics/2012/winter/lecture-2>

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The language of quantum mechanics (week 3-6)

Linear algebra

- Susskind & Friedman, "**Quantum Mechanics: The Theoretical Minimum**" Chapters 2-3
- Kay, Laflamme, Mosca "**An Introduction to quantum computing**", Chapters 2

available at EPFL library <https://academic.oup.com/book/41807>

free pdf version <https://batistalab.com/classes/v572/Mosca.pdf>

Qubits and the new rules of the game

- Susskind & Friedman, "**Quantum Mechanics: The Theoretical Minimum**" Chapters 4-7
- Kay, Laflamme, Mosca "**An Introduction to quantum computing**", Chapter 3

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Quantum harmonic oscillator (week 8-9)

Study the lecture note uploaded with HW2.

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Exploring quantum mechanics beyond harmonic oscillator (week

10)

Study the lecture note uploaded with HW2.

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Entanglement in two-qubit systems (week 11-13)

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Exploring the quantum (week 14-15)

Cavity quantum electrodynamics

Dissipation and decoherence

Quantum measurement process

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