

Quantum Physics II

PHYS4401.01, Spring 2022

Instructor: Fazel Tafti, Higgins 330A, (fazel.tafti@bc.edu)

Class: M/W/F, 1—1:50 PM, Higgins 263

Office hours: Wednesdays at 6:30 pm on Zoom

I. Course Readings

Required text: "Introduction to Quantum Mechanics (2nd Edition)" by David J. Griffiths

Suggested texts: "Quantum Mechanics" by David H. McIntyre.

II. Course Outline

Module	Contents	Lectures	Weeks	Homework
QM in 3D	Spherical coordinates The angular Schrödinger equation The radial Schrödinger equation Hydrogen atom Hydrogen spectrum	7	1-2	3
Angular momentum	Eigenvalues of angular momentum Spherical harmonics Spin Zeeman effect Addition of angular momenta Aharanov-Bohm effect	10	3-5	3
Identical particles	Two-particle system Bosons and Fermions Exchange interactions Helium atom Periodic table Band structure	8	6-7	2
Time independent perturbation	Non-degenerate first-order Non-degenerate second-order Degenerate perturbation Fine structure Relativistic correction Spin-orbit coupling Weak-field Zeeman effect Strong-field Zeeman effect Hyperfine interaction	10	8-10	3
Variational Principle	Theory of variational principle Ground state of helium Hydrogen ion Hydrogen molecule	9	11-12	2