PHYS4702 Introduction to Quantum Mechanics II (Fall 2024)

Class Schedule as of November 23, 2024

The "Chapter.Sec1,Sec2" references are to the books by Townsend, and by Sakurai and Napolitano. I'll take group theory formalism from "Physics from Symmetry" by Schwichtenberg. Additional material in the form of notes and other references will be posted on the course web page. Classes held on dates/days in blue will be taught over Zoom.

Week	Day	Date	Topics	MIQM2e	MQM3e
1	Tue	27 Aug	Continuous Symmetry and Degeneracies; Formalism and Examples	—	4.1
	Thu	28 Aug	The Rotation Group, SU(2), and SO(3)	—	3.3
2	Tue	3 Sep	Lie Algebras and Lie Groups	—	—
	Thu	5 Sep	SO(4) Symmetry in the Hydrogen Atom	—	4.1.4
3	Tue	10 Sep	Potential Energy and Vector Potentials in Quantum Mechanics	—	2.7
	Thu	12 Sep	Gauge Symmetry; The Aharonov Bohm Effect	14.1	2.7
4	Tue	17 Sep	Time-Independent Non-Degenerate Theory: Formalism and Simple Examples	11.1	5.1
	Thu	19 Sep	Finite Nuclear Size Effects in Atoms; The Quadratic Stark Effect	11.1	5.1
5	Tue	24 Sep	Time-Independent Degenerate Perturbation Theory; The Linear Stark Effect	11.2,3	5.2
	Thu	26 Sep	Relativistic Corrections to the Kinetic Energy in One-Electron Atoms	11.5	5.3.1
6	Tue	1 Oct	Angular Momentum Revisited: $\vec{J} = \vec{L} + \vec{S}$	11.5	3.8
	Thu	3 Oct	The Spin-Orbit Interaction; Thomas Precession	11.5	5.3.2
7	Tue	8 Oct	Fine Structure, the Darwin Term, and the Energy Levels of Hydrogen	11.5,6	—
	Thu	10 Oct	Atoms in External Magnetic Fields: The Zeeman Effect	11.7	5.3.3
8	Tue	15 Oct	Discrete Symmetry: Parity	—	4.2
	Thu	17 Oct	Discrete Translation Symmetry, Bloch's Theorem, Crystalline Solids	—	4.3
9	Tue	22 Oct	Time-Dependent Hamiltonians; The Sudden Approximation	4.3	2.1.2; 5.5,6
	Thu	24 Oct	Magnetic Resonance	4.4	5.5.4
10	Tue	29 Oct	Time-Dependent Perturbation Theory Formalism	14.5,6	5.7
	Thu	31 Oct	Density of States and Fermi's Golden Rule	—	5.7
11	Tue	5 Nov	Quantum Mechanical Scattering: Formalism	13.1	—
	Thu	7 Nov	The Born Approximation; Scattering from a Yukawa Potential	13.2,3	6.3
12	Tue	12 Nov	Detour: Covariant Notation; Natural Units	—	8.1.1
	Thu	14 Nov	Relativistic Wave Mechanics: The Klein-Gordon Equation	—	8.1
13	Tue	19 Nov	Relativistic Wave Mechanics: The Dirac Equation	—	8.2
	Thu	21 Nov	Non-relativistic reduction of the Dirac Equation including magnetism	—	8.2,3
25-29 Mar			**Thanksgiving Break (No Classes)**		
14	Tue	3 Dec	Identical Particles; Introduction to Quantum Field Theory	12.1	7.1,2,7
	Thu	5 Dec	The Klein-Gordon Field in Second Quantization	—	8.1.5