PHYS 543 QUANTUM MECHANICS II
FALL 2017
DETAILED SYLLABUS

Part I. Elements of quantum optics • Review of harmonic oscillator and Heisenberg picture • Displacement, phase-shift and squeezing operators • Quantization of the electromagnetic field • Wigner function • The beam splitter • Homodyne tomography	*Lecture notes (Bound & Copied)* *ucalgary.ca/~lvov/673/notes/phys673notes.pdf*
Part II. Physics of the angular momentum • Properties of the angular momentum operator • Hydrogen atom • Periodic table • Addition of angular momentum. Spin-orbit coupling. Fine structure of atomic levels. • Zeeman effect • Bloch sphere • Magnetic moment in a magnetic field. Precession. Stern-Gerlach measurement. • Magnetic resonance • Spin echoes	*Lecture notes (Bound & Copied)* *Griffiths* *Lecture notes (Bound & Copied)*
Part III. Quantum mechanics of complex systems • The density operator • Trace • Density matrix and the Bloch sphere • Partial trace • Generalized measurements • Quantum tomography	*Lecture notes (Bound & Copied)*
Additional subjects [if time permits] • Perturbation theory • Adiabatic theorem and geometric phase • Second quantization	*Griffiths*