PHYS570Y Modern Atomic Physics, Theory

Instructor: F. Robicheaux Spring 2017 Time: 2:30-3:20 MWF

1989 Ramsey, Dehmelt, Paul (ion traps, separated oscillatory fields, maser, atomic clocks), 1997 Chu, Cohen-Tannoudji, Phillips (laser cooling and trapping of atoms), 2001 Cornell, Ketterle, Wieman (Bose-Einstein condensation of atomic gases), 2005 Glauber, Hall, Hansch (optical coherence, frequency comb), 2012 Haroche, Wineland (measuring & manipulation of individual quantum systems)

This class will explore the *theory* behind the incredibly rapid advances in atomic physics during the past ~30 years. The topics to be covered roughly correspond to those that received physics Nobel prizes listed above: interaction of atoms with light, spectroscopy, laser cooling and trapping, magnetic traps, Bose-Einstein condensation, atom interferometry, ion traps, and Qubits/CNOT gates. The material will be developed at a level accessible to advanced undergrad and early grad students.

Required textbook is Christopher J. Foot "Atomic Physics". We will cover Chaps. 7-13.

Required prerequisites are an advanced undergraduate quantum class at the Griffiths level (through Griffiths Chap 5).