PHYSICS 452/562 – – FALL 2017

ATOMIC PHYSICS AND LASERS

Lecture: Tθ – 11:30 - 12:50
Room: Physics PP - 125
Text: Milonni & Eberly, 2nd Edition
Text: Notes distributed in class

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as of August 25, 2017, subject to change

Week # Monday date	Tuesday	Thursday	Reading & Homework
Background in Atomic Physics and Quantum Mechanics.			
I 8/28	Historical Background Classical models	Schrödinger Equation(s) Multiple solutions	Notes: Ch. 1, 2.1, 2.2 Problem set #1
II 9/4	**NO CLASS HOLIDAY**	Rabi and Bloch view for two-level atom	Notes: Ch. 2,; M&E, 9.1-9.3 Prob. set #2
III 9/11	More on Bloch sphere Dressed atom picture	Separate S.E. for H atom Fine structure (intro)	Notes: Ch. 7 Problem set #3
IV 9/18	Fine structure and Hyperfine structure Zeeman, Stark & dipole	Experimental class working in groups on Quantum defects ROSH	Handout on Fine Structure Problem set #4
V 9/25	Quantum Transitions, Ω_R Other Atoms Again Selection Rules	Stimulated Emission A and B Coefficients	Notes: Ch. 3 & 5 Griffiths - maybe?
VI 10/2	**First Hour Exam In Class**	Introduction to Lasers Three and Four levels Gain - Rate Eq's	M & E, Ch. 1
Laser Operation and Types of Lasers.			
VII 10/9	Fabry Perot Longitudinal Modes, Single Mode - Lamb dip	Saturation Spectroscopy Gas Lasers: HeNe, CO_2, Ar^+ Tunable & Dye Lasers	M & E, Ch. 1, Sec 3.6 - 3.12, 4.1 - 4.12 M & E, prob's. 3.10, 3.14, 4.1, 4.4, 4.7
VIII 10/16	Semiconductor Lasers & Locking Schemes (Schneble lecture)	Ring Laser Cavities Managing Optical Frequencies - Modulators	M&E, Sec 5.8 - 5.11; 11.3 - 11.11 M & E, prob's. 5.6, 5.8, 11.4, 11.7, 11.9
IX 10/23	Frequency Locking and Modulation; SAS	Gaussian Beams and Fabry-Perot Resonators	M&E, 11.12 - 11.15
X 10/30	Solid State Lasers Ti:Sapphire	Mode Locked Lasers Pulsed & Freq. Comb	M&E, 7.1-7.9, espec. 7.5 & Table 7.1 7.1, 7.3a, 7.4; prove Eq. 7.5.6
XI 11/6	Resolution Limits	**Second Hour Exam In Class**	
Applications of Lasers - Nobel Prizes.			
XII 11/13	Laser Cooling Temperature Limit	Breaking the Limit Optical Lattices	M&E 14.4 - 14.6
XIII 11/20	Magnetic Traps For Neutral Atoms	**Thanksgiving NO CLASS**	M&E All of ch. 14; prob's 14.6, 14.8a, 14.6, 14.8a, 14.9a,b, 14.11, 14.14, 14.21
XIV 11/27	Evaporative Cooling Bose-Einstein Condensation	Non-Linear Optics Frequency Combs	See assignment above
XV 12/4	Fiber Optics & Lasers Limits to Telecom	Adaptive Optics Coherence - Ducks video	

(Required Statement)

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