

PHYSICS 452/562 – – FALL 2018

ATOMIC PHYSICS AND LASERS

Lecture: T θ – 11:30 - 12:50
 Room: Physics PP - 124
 Text: Milonni & Eberly, 2nd Edition
 Text: Notes distributed in class

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Week # Monday date	Tuesday	Thursday	Reading & Homework
Background in Atomic Physics and Quantum Mechanics.			
I 8/27	Historical Background Classical models	Schrödinger Equation(s) Multiple solutions	Notes: Ch. 1, 2.1, 2.2 Problem set #1
II 9/3	Rabi and Bloch view for two-level atom	More on Bloch sphere Dressed atom picture	Notes: Ch. 2; M&E, 9.1-9.3 Prob. set #2
III 9/10	Atomic Clocks Ramsey method	Separate S.E. for H atom Fine structure (intro)	Notes: Ch. 7 Problem set # 3
IV 9/17	Work in groups on Quantum defects	Fine structure Relativity and spin-orbit	Handout on Fine Structure Problem set # 4
V 9/24	Hyperfine structure Zeeman, Stark & dipole Selection Rules	Quantum Transitions, Ω_R Other Atoms Again	Handouts on hfs and on Zeeman Problem set #5
VI 10/1	A and B Coefficients Stimulated Emission	Non-Linear Optics Harmonic Generation	Notes: Ch. 5 and M & E: Sec. 3.7 M & E - Ch. 10, prob 10.10
VII 10/8	NO CLASSES HOLIDAY	First Hour Exam In Class	
Everything below here is just a space holder. It will be changed.			
Laser Operation and Types of Lasers.			
VIII 10/15	Introduction to Lasers Three and Four levels Gain - Rate Eq's	Fabry Perot Longitudinal Modes, Single Mode - Lamb dip	M & E, Ch. 1 M & E, Ch. 4, Sec's. 1-12 M & E, prob's. 3.10, 3.14, 4.1, 4.4, 4.7
IX 10/22	Gas Lasers: HeNe, CO ₂ , Ar ⁺ Begin Tunable & Dye Lasers	More About Tunable Lasers Ring Laser Cavities	M&E, Sec's. 5.8 - 5.11; 11.3 - 11.11 M & E, prob's. 5.6, 5.8, 11.4, 11.7, 11.9
X 10/29	Solid State Lasers Ti:Sapphire, DPSS, and Semiconductor Lasers	Saturated Absorption Spect. Modulation and Managing Optical Freq's.	M & E, 11.12 - 11.15
XI 11/5	Gaussian Beams and Fabry-Perot Resonators	TBA	M&E, 7.1-7.9, espec. 7.5 & Table 7.1 7.1, 7.3a, 7.4; prove Eq. 7.5.6
XII 11/12	Resolution Limits Mode Locked Lasers Pulsed & Freq. Comb	Second Hour Exam In Class	
Applications of Lasers - Nobel Prizes.			
XIII 11/19	Laser Cooling & Temp. Limit Breaking the Limit	Thanksgiving NO CLASS	M&E 14.4 - 14.6
XIV 11/26	Optical Lattices & Magnetic Traps For Neutral Atoms	TBA	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
XV 12/3	Fiber Optics & Lasers Limits to Telecom	Adaptive Optics Coherence - Ducks video	

(Required Statement)

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