

Physics 550 - Atomic Physics

Winter 2021

- Instructor: Subhadeep Gupta
- Office: B428 Physics & Astronomy Building (616-9649), deepg@uw.edu
- Lectures: T Th 12:30-1:50 pm, by Zoom only
- Office Hours: Fixed hours to be decided and also by appointment (just send an email)
- Text: *Atomic Physics* by Foot is recommended. Other suggestions are *Atomic Physics* by Budker, Kimball, & DeMille, *Quantum Optics* by Scully & Zubairy. Supplied notes and handouts.
- Homework: Four sets of HW problems will be assigned through the quarter.
- Term Paper: You are required to write a 4-page (or longer) paper in Physical Review format on an atomic physics topic chosen in consultation with the instructor(see schedule on reverse).
- Course grade: Based on the homework sets (2/3) and the paper (1/3).
- Course Website: <http://faculty.washington.edu/deepg/phys550/>

If you would like to request academic accommodations due to a disability, please contact Disabled Student Services, 448 Schmitz, 543-8924 (V/TDD). If you have a letter from Disabled Student Services indicating you have a disability that requires academic accommodations, please present the letter to me (the instructor) so we can discuss the accommodations you might need for class.

Course Schedule

Date	Topic	Foot Text
Jan 5, 7	Hydrogen atom, fine structure, helium atom	Ch. 1-3
Jan 12, 14	Alkali atoms, LS coupling, Zeeman and hyperfine HW 1 due on Jan 14	Ch. 4-6
Jan 19, 21	Interaction with radiation: Rabi, Ramsey, Light Shift	Ch. 7
Jan 26, 28	Laser cooling and trapping HW 2 due on Jan 28	Ch. 8 & 9
Feb 2, 4	BEC and Degenerate Fermi gases	Ch. 10 & handouts
Feb 9, 11	Two Atoms: interactions and molecules HW 3 due on Feb 11	handouts
Feb 16, 18	Optical Traps and Lattices	Ch.9 & handouts
Feb 23, 25	Atomic Interferometry, Ion Traps HW 4 due on Feb 25	Ch. 11, 12 & handouts
Mar 2, 4	Additional Topic(s) TBD	handouts
Mar 9, 11	Additional Topic(s) TBD	handouts
Mar 18	Thursday 5pm deadline for final paper	

As indicated above, a selection of additional topics will be covered, with exact content to be determined, but is likely to be chosen from: analog quantum simulation with atoms in optical lattices; generating entanglement in trapped ions and atoms; quantum optics: coherent and squeezed states; atom-cavity systems and strong coupling; long-range interactions and applications to quantum information processing: trapped ions, Rydberg atoms, polar molecules; atom interferometry to test fundamental physics and for force sensing.