BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
K K BIRLA GOA CAMPUS
2019-20 SEMESTER I

COURSE HANDOUT

- Course: PHY F342 Atomic & Molecular Physics
- Instructor in-charge: Raghunath Ratabole
- Email: ratabole@goa.bits-pilani.ac.in

- Course Description: How do we build a quantitative understanding the experimentally measured spectra of atoms and molecules? In doing so, we will formulate, solve & refine models of hydrogenic atoms, two-electron atoms, many-electron atoms and diatomic molecules in order to explain these spectral properties. This process will expose the student to various scientific practices which are central to any research discipline. This course will form the prequisite to contemporary topics in atomic, molecular & optical physics such as optical forces & laser cooling of atoms, atom trapping, Bose-Einstein condensation.
- Text Book: Bransden, B. H., Joachain, C. J. (2003). Physics of atoms and molecules. Pearson
- Reference Books:
  - Bethe, H. A., & Salpeter, E. E. (2012). Quantum mechanics of one-and two-electron atoms. Springer Science & Business Media.
  - Demtröder, W. (2010). Atoms, molecules and photons (p. 194). Heidelberg:: Springer.
- Other resources:
  - `https://www.nist.gov/pml/atomic-spectra-database`
  - `https://www.nist.gov/pml/atomic-spectroscopy-compendium-basic-ideas-notation-data-and-`

Lecture Plan

Chap No	Lecture Title	Text Reference
1	Electrons, Photons and Atoms	
3	One-electron atoms	3.3, 3.4, 3.5, 3.6
4	Interaction of one-electron atoms with electromagnetic radiation	4.1, 4.2, 4.3, 4.5, 4.7
5	One-electron atoms - Fine structure	5.1
6	Interaction of one-electron atoms with external electric and magnetic fields	6.1, 6.2
7	Two-electron atoms	7.1 to 7.6
8	Many-electron atoms	8.1 to 8.5
9	Interaction of many-electron atoms with electromagnetic radiation and external electric and magnetic fields	9.1 to 9.9

Evaluation Scheme

Component	Nature	Weight
CW+HW	Open	30%
MidSem	Handwritten sheet	25%
Comprehensive	Handwritten sheet	45%

Honour Code

While working on a problem set (classwork or homework) or exams and while responding to attendance calls or signing attendance sheets, I will not engage in plagiarism, unauthorized collaboration, cheating or facilitating academic dishonesty.