PC3602: Quantum Mechanics of Atoms and Molecules

1. Lecturer

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2. Reference Books

The main reference books are by S. Gasiorowicz, Quantum Physics (Wiley, 2003) and F. Mandl, Quantum Mechanics (Wiley, 1992). An advanced reference is by L.D. Landau and E.M. Lifshitz, Quantum Mechanics (Pergamon, 1977). Please note that this last book is mainly used for postgraduate course on the subject.

3. Assessment

a. 4 example sheets
b. 1 hour 30 minutes examination in May/June (100%)

4. Aim

To better understand quantum mechanics by learning several analytical methods and by applying these methods to atoms and molecules.

5. Outline

a. Review of basic QM (harmonic oscilator, Dirac notation, matrix representation, etc. 4 lectures)
b. Angular momentum, hydrogenlike atoms and periodical table (6 lectures)
c. Approximation methods (Time-independent (2nd order) and -dependent PT, Fermi’s golden rule, variational method, helium atom, etc. 6 lectures)
d. Introduction to molecular QM ($H_2^+$ ion, molecular orbitals, structures of diatomic molecules, etc. 6 lectures)
e. Revision and exercises (2 lectures)