9/3/09

QUANTUM Theory of MANY-PARTICLE systems (540)
Numerical work (I suggest a target date of 9/22 but if there are difficulties, we can agree on a later date)

(1) Write (jointly) a computer program that solves the differential equation for the radial wave function at negative energies for the effective potential an electron experiences in an atom. Use a smooth function to go from $-Z/r$ at small r to $-1/r$ at large r. Find the lowest eigenvalues of this potential consistent with the number of electrons that you are considering, *i.e.* you should find all the eigenvalues relevant for putting all the electrons in according to the Pauli principle. Read Secs.10.2.3 and 10.2.4 for a possible approach to this problem. Note that the present implementation leads to significant simplifications as compared to the equations that are solved in these sections. Do at least helium and neon and compare the results for the occupied levels you obtain as much as possible with experimental data.