

Visualisation of Electromagnetic Fields

The ASE will involve using computational software (Mathematica/Matlab/Python – it is up to you) to plot vector and scalar fields describing electromagnetic phenomena. Various exercises will be completed to simulate scenarios and ultimately an interactive program will be developed for a range of possible simulations.

Assessment

Report – 80 %

Logbook (codes) – 20 %

First term:

Familiarise yourself with programming in your selected software (plotting, figure labels, programming etc.). You will plot 2D vector and scalar fields.

To get started:

(a) Plot the electric field lines and equipotentials for two point charges q_1 and q_2 when

- (i) $q_1 = q_2 = +q$
- (ii) $q_1 = 4q_2$
- (iii) $q_1 = -q$

(b) Now plot the field lines for three point charges with one of the point charges located on the y-axis ($y \neq 0$), midway between the other two charges on the x-axis. Assume that all are positively charged.

(c) Let's look at developing an interactive program where charges and distances can be changed easily. As an example you could use Mathematica's 'manipulate' function to do this.

Try new things and explore!!

Second term: Magnetic fields!

Start by modeling the Biot-Savart Law, Helmholtz Coils etc,