

ELECTRICITY AND MAGNETISM

F1005

Module 1, Activity 2

Coulomb's law and electric field

The force between charges was first experimentally discovered by the Greeks but formulated by Charles A. Coulomb in France. It forms the basis of the understanding of electric field and therefore we will spend some time solving simple problems related to this.

1. For Coulomb's law and electric field calculations, it is very convenient to use software to speed up your work. Write a program using the software of your choice (C, Java, MATLAB, Excel, etc.) which performs calculations of the force between charges and electric field.
2. Test your program solving these exercises:
 - a. Three point charges of $1\text{ }\mu\text{C}$, $4\text{ }\mu\text{C}$ and $-2\text{ }\mu\text{C}$ are located at $(1,2,4)$, $(-1,1,1)$ and $(0,-3,1)$, respectively, in free space. Determine the *force* that is exerted on the $4\text{ }\mu\text{C}$ by the other two.
 - b. Now, remove the $-2\text{ }\mu\text{C}$ charge and calculate the *electric field* produced at that point $(0,-3,1)$ by the other two charges.
3. The concept of *electric charges* can often be difficult to understand if it is not “seen”. Design an experiment in which you can verify the existence of electrical charges and their rules (equal charges repel whereas opposite charges attract). Take a simple video of your experiment and upload the link in Blackboard.