Chapter 2: Electrostatics

For this chapter you should:

- know Coulomb’s law for the force between two point charges and be able to use this to solve problems,
- know Coulomb’s law for the electric field of a collection of point charges and be able to use this to solve problems,
- know Coulomb’s law for the electric field of a continuous distribution of charge (line, surface, or volume) and be able to use this to calculate the electric field of such a charge distribution at a specified point in space,
- know Gauss’ law in differential form and be able to use it to determine the charge distribution of a given electric field,
- know Gauss’ law in integral form and be able to use it to determine the electric field of highly symmetric charge distributions,
- know how to calculate the electric potential at a specified point if given the electric field,
- know how to calculate the electric field at any point given the electric potential,
- know that the electric field has zero curl and be able to use this fact to test whether a given vector field could possibly represent an actual electric field,
- know how to calculate the potential of a localized charge distribution (line, surface, or volume),
- know, and be able to derive, the boundary conditions for the components of the electric field at a boundary where a surface charge may exist,
- know and be able to prove that the electric potential is continuous across a surface charge boundary layer,
- be able to use the boundary conditions on the electric field and electric potential to check the validity of results obtained where you are required to calculate either the field or potential,
- know that the potential difference between two points is equal to the work per unit charge required to carry a charge from one point to the other,
- be able to compute the energy stored in a collection of point charges (2.42),
- be able to compute the energy stored in a volume given the charge density and potential in that volume (2.43),
- be able to compute the energy stored in a volume given the electric field inside the volume and the potential on the surface that encloses the volume (2.44),
- be able to compute the energy stored in the electric field if the value of the electric field over all space is known (2.45),
- know the basic properties of conductors and be able to use these properties to deduce the characteristics of fields inside and outside of conductors,
- be able to compute the capacitance of a given capacitor given the geometrical arrangement of the capacitor.