

## Section 4 – The Electrical Properties of Materials

Students will be able to:

- 4.1 distinguish between resistance and resistivity
- 4.2 use Ohm's Law.
- 4.3 explain how the resistivity of metals is governed by electron scattering
- 4.4 explain the effects of structural defects on resistivity
- 4.5 use energy-band diagrams to distinguish between metals, insulators, and semiconductors.
- 4.6 explain why a full valence electron band leads to insulating behavior
- 4.7 describe a capacitor and the concepts of dielectric constant and dielectric strength.
- 4.8 define what is meant by a hole in a semiconductor
- 4.9 describe how electron-hole pairs can be generated
- 4.10 explain the different temperature dependence of resistivity in a metal and an intrinsic semiconductor.
- 4.11 distinguish between p-type and n-type dopants in a semiconductor and give examples for the case of dopants in Si.
- 4.12 describe the construction and operation of a p-n junction and how this leads to its characteristic I-V curve.