

# Electricity

## Topic Tree of Current Electricity Textbook Lesson

### 3.1 Introduction

- Definition of electric current
- Natural occurrences of electric currents
- Examples of steady electric currents in daily life

### 3.2 Electric Current

- Definition of electric current through a cross-sectional area
- SI units of current (ampere)
- Explanation of steady and non-steady currents

### 3.3 Electric Currents in Conductors

- Movement of electric charge in conductors
- Description of free and bound charges
- Explanation of electric current in solid conductors and electrolytic solutions

### 3.4 Ohm's Law

- Statement and explanation of Ohm's Law ( $V = IR$ )
- Dependence of resistance on material and dimensions
- Calculations of resistance in different configurations

### 3.5 Drift of Electrons and the Origin of Resistivity

- Concept of drift velocity
- Relation between drift velocity and electric field
- Origin of resistivity in materials
- Mobility of charge carriers

### 3.6 Limitations of Ohm's Law

- Situations where Ohm's Law does not apply
- Examples of non-ohmic materials and devices

### 3.7 Resistivity of Various Materials

- Classification of materials based on resistivity (conductors, semiconductors, insulators)
- Table of resistivities for common materials
- Explanation of temperature dependence of resistivity

### **3.8 Temperature Dependence of Resistivity**

- Mathematical relationship between resistivity and temperature
- Graphical representation of resistivity vs. temperature for different materials
- Practical examples and calculations

### **3.9 Electrical Energy and Power**

- Calculation of electrical energy and power ( $P = IV$ ,  $P = I^2R$ ,  $P = V^2/R$ )
- Explanation of power dissipation in resistors
- Applications in power transmission and devices

### **3.10 Combination of Resistors**

- Series and parallel combinations of resistors
- Calculation of equivalent resistance
- Practical examples and circuit analysis

### **3.11 Cells, EMF, Internal Resistance**

- Definition of EMF and internal resistance of cells
- Calculations involving cells in circuits
- Practical examples and problem-solving

### **3.12 Cells in Series and Parallel**

- Combination of cells in series and parallel
- Calculation of equivalent EMF and internal resistance
- Practical applications and problem-solving

### **3.13 Kirchhoff's Rules**

- Kirchhoff's current law (KCL) and voltage law (KVL)
- Application of Kirchhoff's rules in complex circuits
- Example problems and solutions

### **Practical Examples and Problems**

- Solved examples to illustrate concepts
- Practical applications of laws and rules in circuits
- Detailed step-by-step problem-solving techniques