

Electricity

Lecture Notes: Current Electricity

3.1 Introduction

- **Electric Current:** The movement of electric charge constitutes an electric current. In a conductor, this is typically due to the flow of electrons.
- **Natural Occurrences of Electric Currents:**
 - **Lightning:** A natural phenomenon where electric charges flow from clouds to the earth through the atmosphere.
 - **Nervous System:** Electric currents occur in the human nervous system as nerve impulses.
- **Examples of Steady Electric Currents in Daily Life:**
 - **Torch:** Electric current flows steadily to produce light.
 - **Cell-driven Clock:** Electric current from a battery powers the clock continuously.

3.2 Electric Current

- **Definition of Electric Current through a Cross-Sectional Area:**
 - Imagine a small area held normal (perpendicular) to the direction of flow of charges.
 - Let q^+ be the net amount of positive charge flowing forward across the area in a time interval t .
 - Similarly, let q^- be the net amount of negative charge flowing forward.
 - The net amount of charge q flowing in the forward direction is $q = q^+ - q^-$.
 - Current I is then defined as $I = \frac{q}{t}$.
- **SI Units of Current (Ampere):**
 - The unit of electric current in the International System of Units (SI) is the **ampere (A)**.
 - 1 ampere = 1 coulomb of charge passing through a point per second.
- **Explanation of Steady and Non-Steady Currents:**
 - **Steady Current:** The electric current that remains constant over time, like water flowing smoothly in a river. For example, current in household electrical appliances.
 - **Non-Steady Current:** The electric current that varies with time. Examples include lightning and varying currents in certain electronic circuits.