10Th Class

➢ Magnetic Field Due To Current:

1. **Ampere's Law:**
   - Ampere's law states that the magnetic field (B) around a current-carrying conductor is directly proportional to the current (I) passing through the conductor.
   - It also depends on the distance (r) from the conductor, following the inverse square law.
2. **Right-Hand Thumb Rule:**
   - According to the right-hand thumb rule, if you curl the fingers of your right hand around a conductor in the direction of current flow, your thumb points in the direction of the magnetic field lines around the conductor.
3. **Magnetic Field Lines:**
   - Magnetic field lines around a straight current-carrying conductor form concentric circles.
   - The direction of the magnetic field lines can be determined using the right-hand thumb rule.
4. **Magnetic Field Strength:**
   - The strength of the magnetic field (B) at a point around a current-carrying conductor depends on the magnitude of the current (I) and the distance (r) from the conductor.
   - It is measured in tesla (T) or gauss (G).
5. **Direction of Magnetic Field:**
   - The direction of the magnetic field lines around a straight current-carrying conductor is clockwise if the current is flowing away from the observer and counterclockwise if the current is flowing towards the observer.

❖ Applications:

1. **Electromagnets:**
   - Electromagnets are devices that produce a magnetic field when an electric current flows through a coil of wire.
   - They are used in various applications such as electric motors, generators, MRI machines, and magnetic levitation trains.
2. **Current-Carrying Wires:**
   - Understanding the magnetic field due to current is essential for designing and analyzing circuits, especially in applications where magnetic interference needs to be minimized or utilized.
3. **Magnetic Compass:**

- A magnetic compass needle aligns itself with the Earth's magnetic field, which is due to the current flow in the Earth's core.

4. **Induction Cooking:**
   - Induction cooktops use magnetic fields induced by alternating current (AC) to heat ferromagnetic cookware directly.

❖ Factors Affecting Magnetic Field:

1. **Current Strength:**
   - The stronger the current flowing through a conductor, the stronger the magnetic field around it.
2. **Distance from Conductor:**
   - The magnetic field strength decreases with increasing distance from the current-carrying conductor according to the inverse square law.
3. **Number of Turns in Coil:**
   - In the case of a solenoid or coil, the magnetic field strength increases with the number of turns of wire and the strength of the current.
4. **Medium Surrounding Conductor:**
   - The magnetic properties of the medium surrounding the conductor can affect the strength and behavior of the magnetic field.

Understanding the magnetic field due to current is fundamental in various fields, including electromagnetism, electrical engineering, and physics. It provides insights into the behavior of magnetic fields around current-carrying conductors and enables the design and analysis of magnetic systems and devices.