Magnetic Materials

- A magnetic material is a material that experiences a force when placed in a magnetic field
- Although all magnetic materials are metallic, but not all metals are magnetic
- **Common magnetic materials include:**
  - Iron
  - Steel (an alloy of iron)
  - Nickel
  - Cobalt
- **Common non-magnetic materials:**
  - Copper
  - Aluminum
  - Brass

Soft Magnetic materials (e.g. Iron)	**Hard Magnetic materials (e.g. Steel)**
➢ Are easy to magnetize	➢ Are hard to magnetize
➢ Easily lose their magnetism or easily demagnetize	➢ Do not easily lose their magnetism or hard to demagnetize
➢ **Electromagnets** are made out of magnetically soft materials, as we want them to be able to easily gain and lose their magnetism	➢ **Permanent magnets** are made out of magnetically hard materials, as we don't want them to lose their magnetism

Induced Magnetism

- When a magnetic material is placed in a magnetic field, the material can temporarily become magnetized:
  - One end of the material will become a north pole
  - The other end will become a south pole
- This process is known as **magnetic induction**

Methods of Magnetization:

- Stroking with a magnet
- Using a direct current (d.c.) in a coil
- Hitting with a hammer in a magnetic field

Methods of Demagnetisation

- Magnets can be demagnetised by using one of the following methods:
  - **Hit the material with a hammer** (when it is not in a magnetic field)
  - **Heat the material** (until it begins to glow) and then slowly let it cool
  - Place the material **in a coil containing alternating current (a.c.)** and then slowly withdraw the material (with the a.c. power source still attached to the coil)

Solenoids can be used to magnetise and demagnetise magnetic materials (p. 210); dropping or heating a magnet also causes demagnetisation. Hammering a magnetic material in a magnetic field causes magnetisation but in the absence of a field it causes demagnetisation. 'Stroking' a magnetic material several times in the same direction with one pole of a magnet will also cause it to become magnetised.

Magnetic Fields

- The space surrounding a magnet where it produces a magnetic force is called a magnetic field.
- Magnetic field lines or Lines of Force are a useful way of helping us to picture that field: Its strength and its direction
- Magnetic field lines obey a couple of rules:
  - They always go from north to south
  - They never touch or cross each other

Plotting a Magnetic Field / lines of force:

- Using Iron Filings
- Plotting Compass method