Electromagnetic induction

Here is a **clear comparison between Self Inductance and Mutual Inductance** (NCERT Class 12 – Electromagnetic Induction):

Self Inductance

- **Definition**: The property of a coil (or circuit) by which it opposes any change in current through itself, by inducing an emf in the same coil.
- **Formula**:
  $$e = -L\frac{di}{dt}$$
  where **L** = self-inductance, **di/dt** = rate of change of current in the same coil.
- **Unit**: Henry (H).
- **Symbol**: L.
- **Physical Meaning**: A measure of the coil's ability to produce back emf in response to change in its own current.
- **Example**: Choke coil in fluorescent lamps, solenoid.

Mutual Inductance

- **Definition**: The property of one coil (primary) by which it induces an emf in a nearby coil (secondary), whenever the current in the primary coil changes.
- **Formula**:
  $$e = -M\frac{di}{dt}$$
  where **M** = mutual inductance, **di/dt** = rate of change of current in the neighboring coil.
- **Unit**: Henry (H).
- **Symbol**: M.
- **Physical Meaning**: A measure of the coupling between two coils through magnetic flux linkage.
- **Example**: Transformer, wireless charging, induction coil.

Comparison Table

Feature	Self Inductance (L)	Mutual Inductance (M)
Coil involved	Single coil	Two nearby coils
Cause of emf	Change in current in the same coil	Change in current in the neighboring coil
Formula	$e = -L\frac{di}{dt}$	$e = -M\frac{di}{dt}$
Physical significance	Opposes change in its own current	Produces emf in another coil
Applications	Choke coil, inductors	Transformer, induction furnace, wireless power