SELF INDUCTANCE:

Inductance is the property of electrical circuits containing coils in which a change in the electrical current induces an electromotive force (emf). This value of induced emf opposes the change in current in electrical circuits and electric current 'I' produces a magnetic field which generates magnetic flux acting on the circuit containing coils. **The ratio of the magnetic flux to the current is called the self-inductance.**

$$L = \frac{\psi = N\emptyset}{I}$$

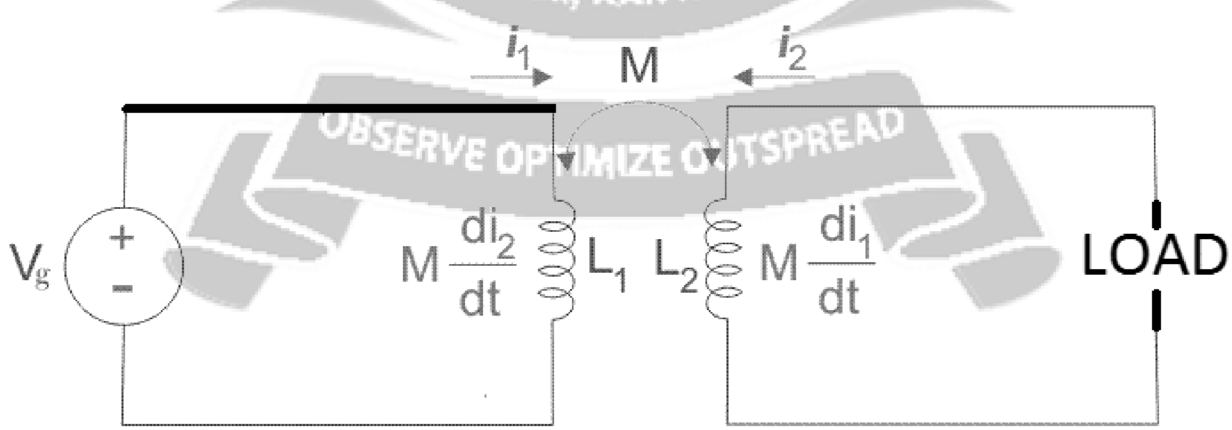
The phenomenon of inducing an emf in a coil whenever a current linked with coil changes is called induction. Here units of L are Weber p

er ampere which is equivalent to Henry.

'Ø' denotes the magnetic flux through the area spanned by one loop, 'I' is the current flowing through the coil and N is the number of loops (turns) in the coil.

MUTUAL INDUCTANCE:

Mutual Inductance is the ratio between induced Electro Motive Force across a coil to the rate of change of current of another adjacent coil in such a way that two coils are in possibility of flux linkage. Mutual induction is a phenomenon when a coil gets induced in EMF across it due to rate of change current in adjacent coil in such a way that the flux of one coil current gets linkage of another coil. Mutual inductance is denoted as (M), it is called co-efficient of Mutual Induction between two coils



Mutual inductance for two coils gives the same value when they are in mutual induction witheach other. Induction in one coil due to its own rate of change of current is called self-inductance(L), but due to rate of change of current of adjacent coil it gives **mutual inductance** (M)
From the above figure, first coil carries current i1 and its self-inductance is L1. Along with its self-inductance it has to face mutual induction due to rate of change of current i2 in the second coil. Same case happens in the second coil also. Dot convention is used to mark the polarity of the mutual induction. Suppose two coils are placed nearby

Coil 1 carries I1 current having N1 number of turns. Now the flux density created by the coil 1 is B1. Coil 2 with N2 number of turns gets linked with this flux from coil 1. So flux linkage in coil 2 is N2.

φ21 [φ21 is called leakage flux in coil 2 due to coil 1].

$$\varepsilon_2 = -N_2 . \frac{d\varphi_{21}}{dt} \ volt.$$

$$Again, \ \ \varepsilon_2 = -M_{21} . \frac{dl_1}{dt} \ volt.$$

Now it can be written from these equations,

$$M_{21} = \frac{\varphi_{21} N_2}{I_1}$$

$$\mathbf{L_{eq}} = \frac{L_1 L_2 - M^2}{(L_1 + L_2 + 2M)}$$