

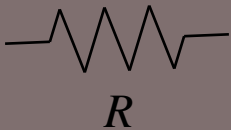
# Series RLC Circuit

When a resistor, inductor, and capacitor are connected in series with the voltage supply, the circuit so formed is called series RLC circuit. Since all these components are connected in series, the current in each element remains the same.

# Series RLC Circuit

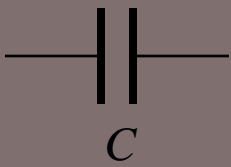


$$V_0 \sin \omega t$$



$$V_R = IR$$

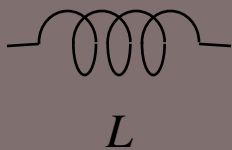
$R$



$$V_C = IX_C$$

$$X_C = 1/\omega C$$

$C$



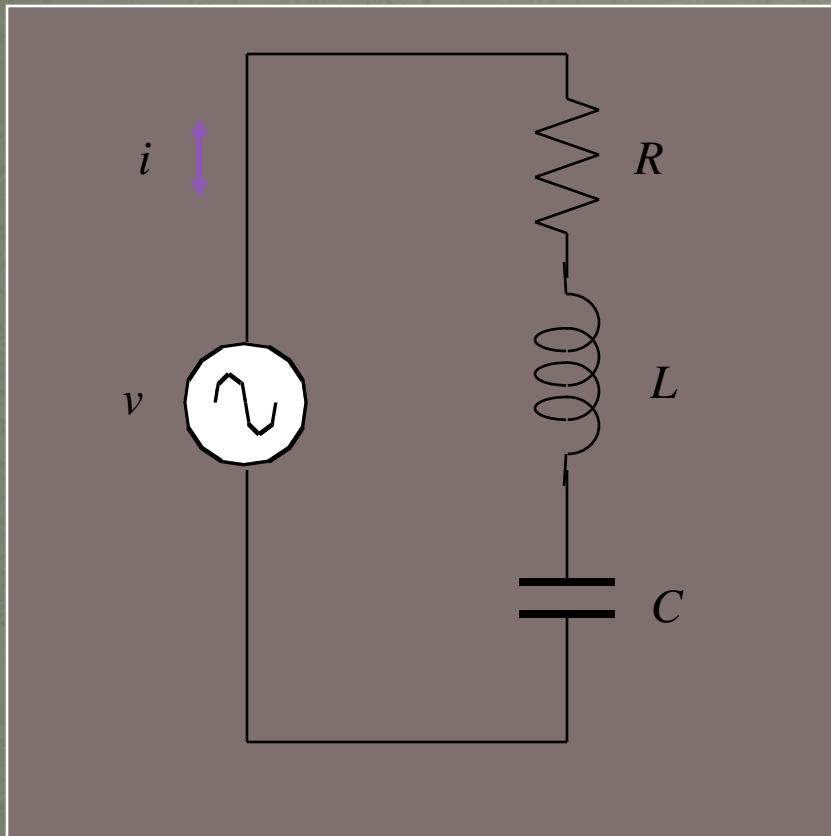
$$V_L = IX_L$$

$$X_L = \omega L$$

$L$

- An AC circuit is made up with components.
  - Power source
  - Resistors
  - Capacitor
  - Inductors
- Kirchhoff's laws apply just like DC.
  - Special case for phase

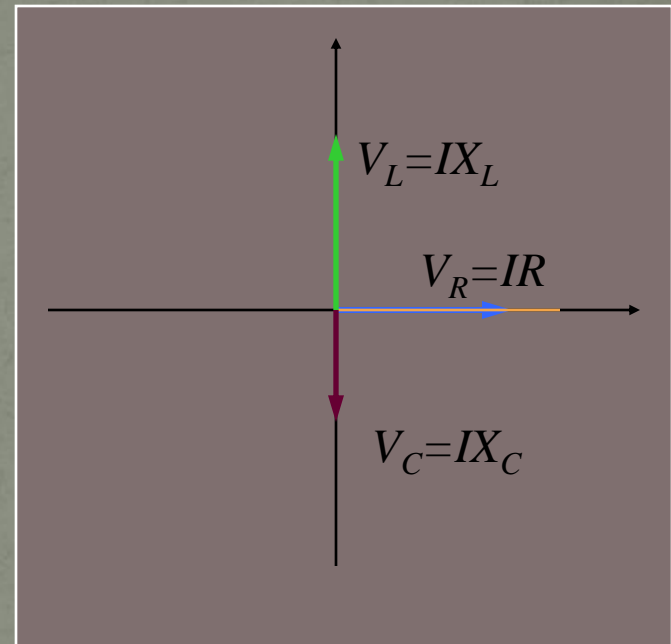
# Series RLC



- A series RLC circuit can be made from each component.
  - One loop
  - Same current everywhere
- Reactances are used for the capacitors and inductors.
- The combination of resistances and reactances in a circuit is called *impedance*.

# Vector Map

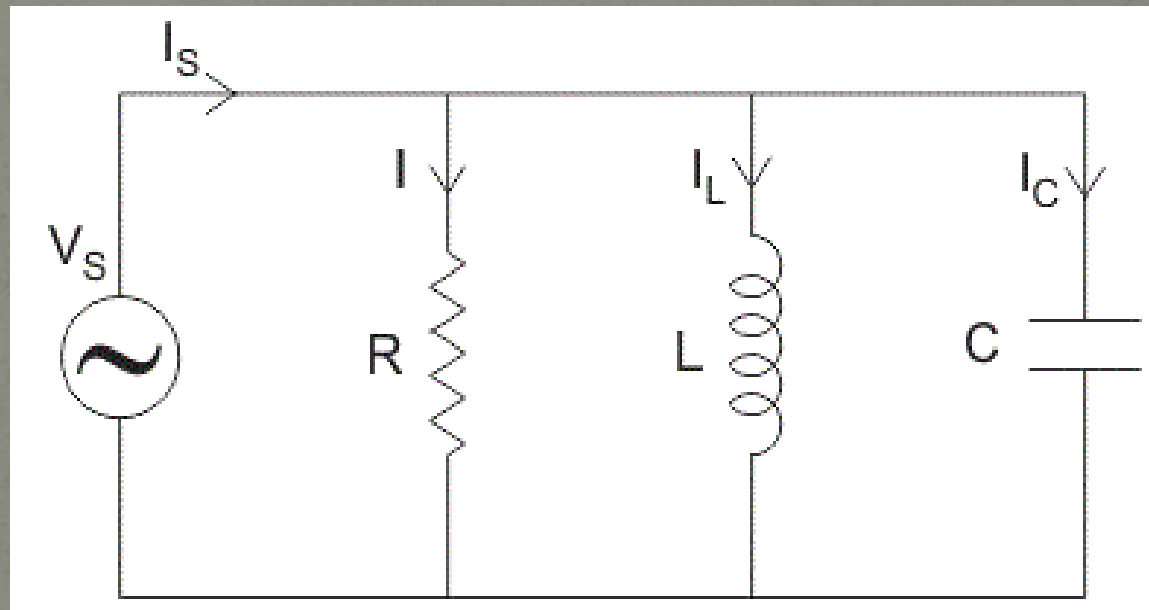
- Phase shifts are present in AC circuits.
  - $+90^\circ$  for inductors
  - $-90^\circ$  for capacitors
- These can be treated as if on the y-axis.
  - 2 D vector
  - Phasor diagram



# Parallel RLC Circuit

- In parallel RLC Circuit the resistor, inductor and capacitor are connected in parallel across a voltage supply. The parallel RLC circuit is exactly opposite to the series RLC circuit. The applied voltage remains the same across all components and the supply current gets divided. The total current drawn from the supply is not equal to mathematical sum of the current flowing in the individual component, but it is equal to its vector sum of all the currents, as the current flowing in resistor, inductor and capacitor are not in the same phase with each other; so they cannot be added arithmetically.

# Parallel RLC Circuit



# Phasor diagram of parallel RLC circuit Parallel RLC

- $I_R$  is the current flowing in the resistor,
- $I_C$  is the current flowing in the capacitor, C in amps.
- $I_L$  is the current flowing in the inductor, L in amps.
- $I_s$  is the supply current in amps.
- In the parallel RLC circuit, all the components are connected in parallel; so the voltage across each element is same. Therefore, for drawing phasor diagram, take voltage as reference vector and all the other currents i.e  $I_R$ ,  $I_C$ ,  $I_L$  are drawn relative to this voltage vector.

# Phasor diagram of parallel RLC circuit

