BEEE101L – Basic Electrical Engineering

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Module 2 : AC Circuits 6 Hrs

Alternating voltages and currents, RMS, average, form factor, peak factor; Single phase RL, RC, RLC series and parallel circuits; Power and power factor; Balanced three phase systems

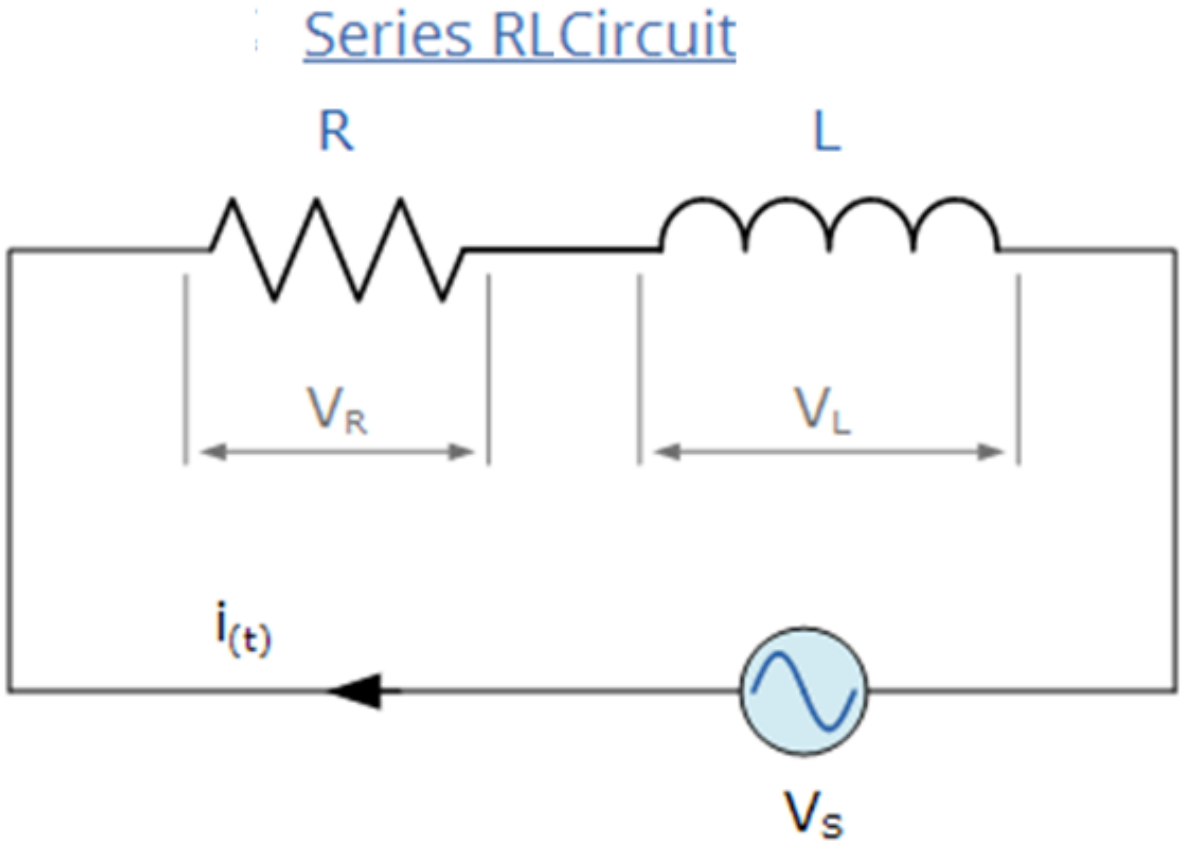
Course Outcome

- Evaluate AC circuit parameters using laws

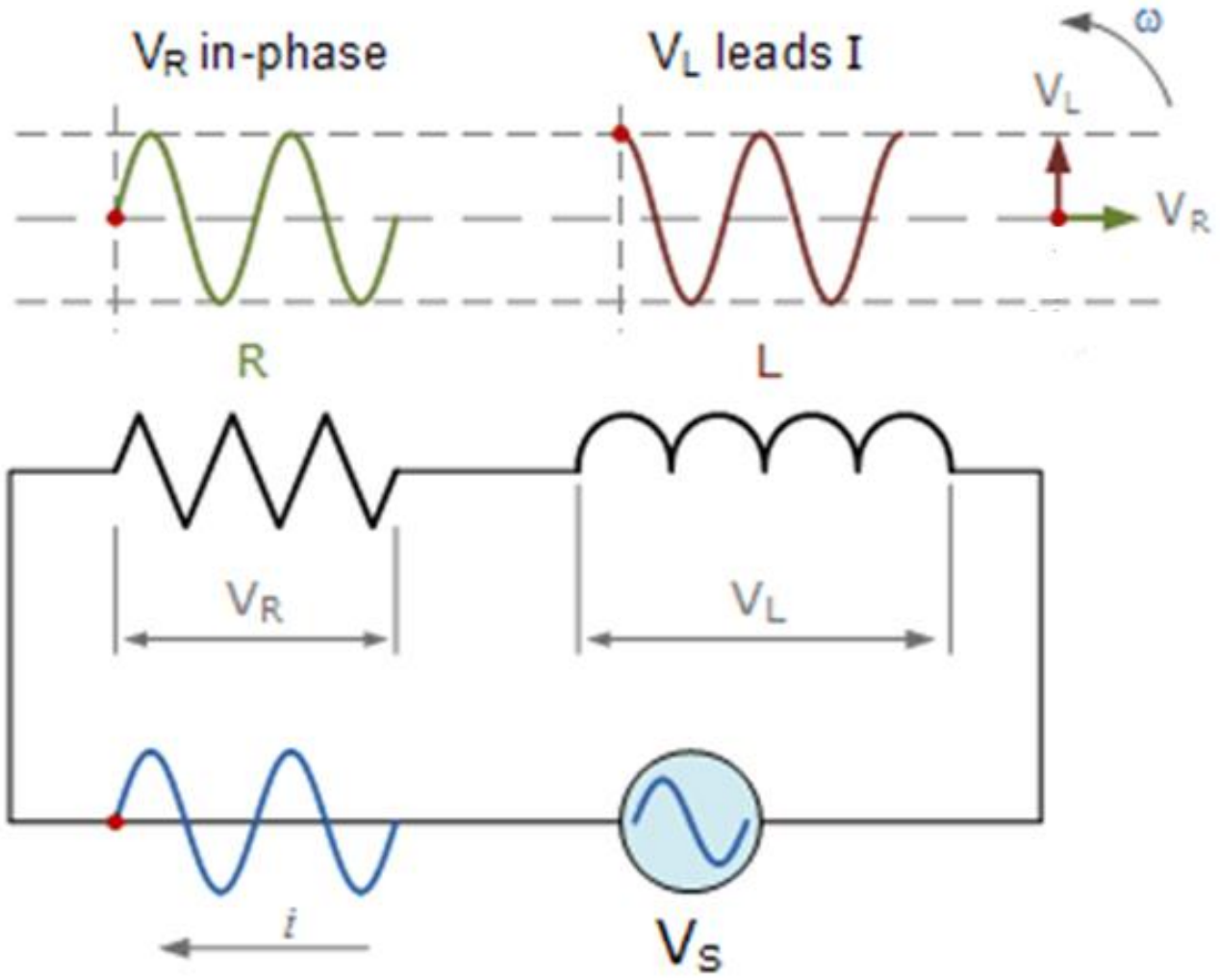
j Operator

- $j=\sqrt{-1}$
- $j^2=-1$
- $j^3=-j$
- $j^4=1$

RL series circuit

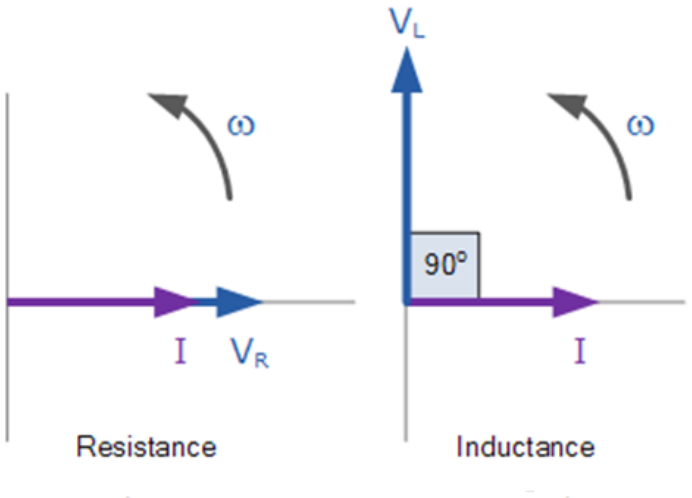


RL series circuit

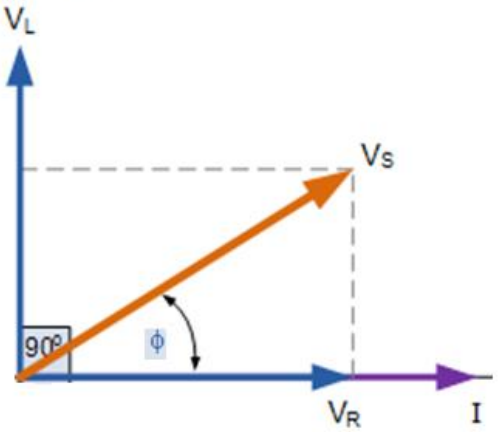


RL series circuit

Individual Voltage Vectors



Phasor Diagram for a Series RL Circuit



RL series circuit

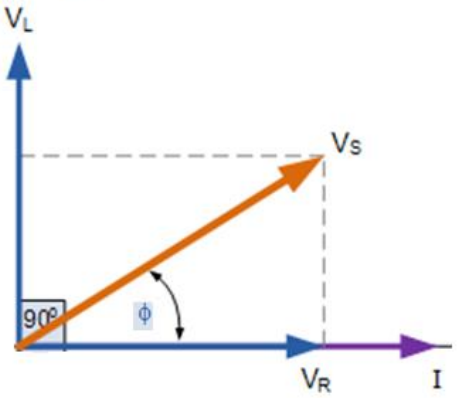
$$V_R = I.R \qquad V_L = jI.X_L$$

$$V_S = \sqrt{(I.R)^2 + (I.X_L)^2}$$

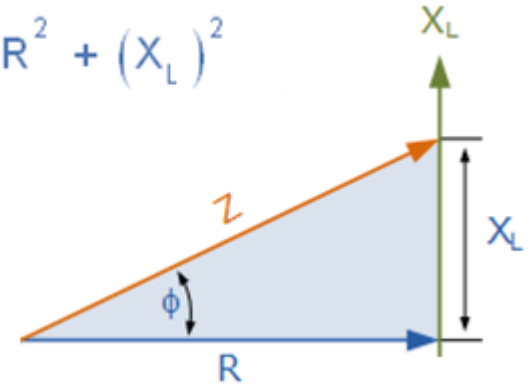
$$V_S = I.\sqrt{R^2 + (X_L)^2}$$

$$\therefore V_S = I \times Z \qquad \text{where: } Z = \sqrt{R^2 + (X_L)^2}$$

Phasor Diagram for a Series RL Circuit



$$Z^2 = R^2 + (X_L)^2$$

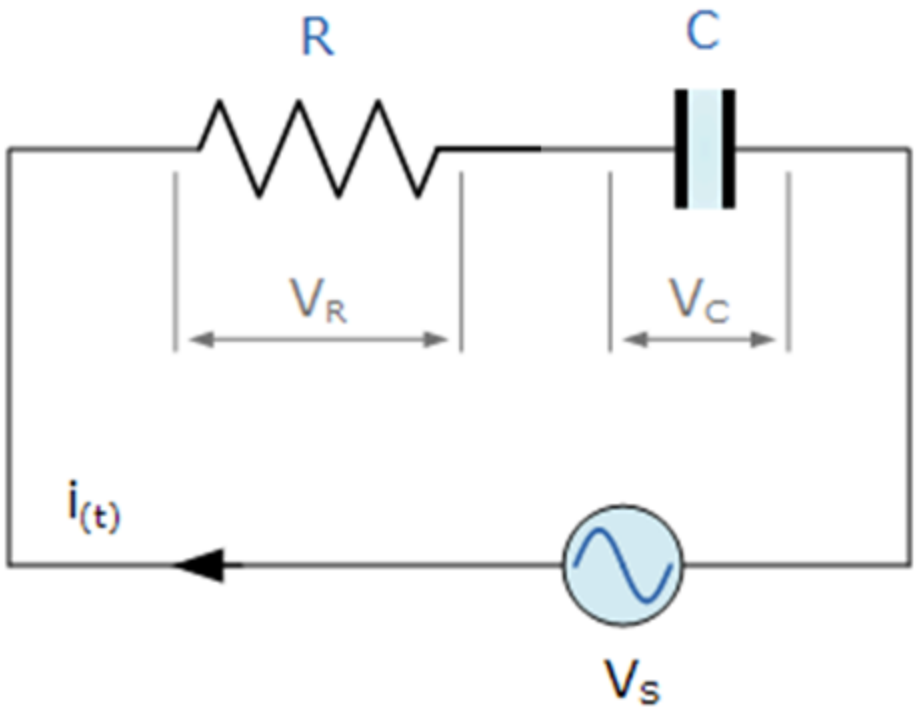


RL series circuit

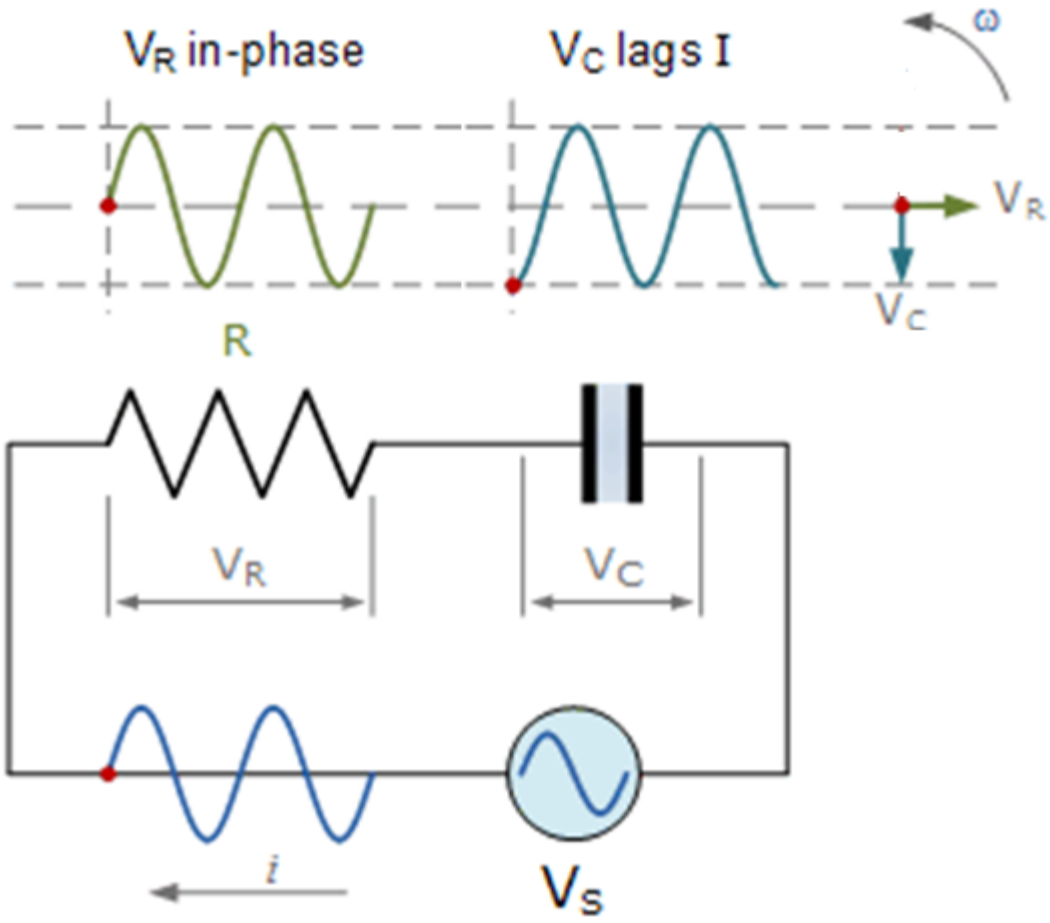
- Impedance
- Phase diagram
- Impedance triangle
- Power factor
- Power

RC series circuit

Series RC Circuit

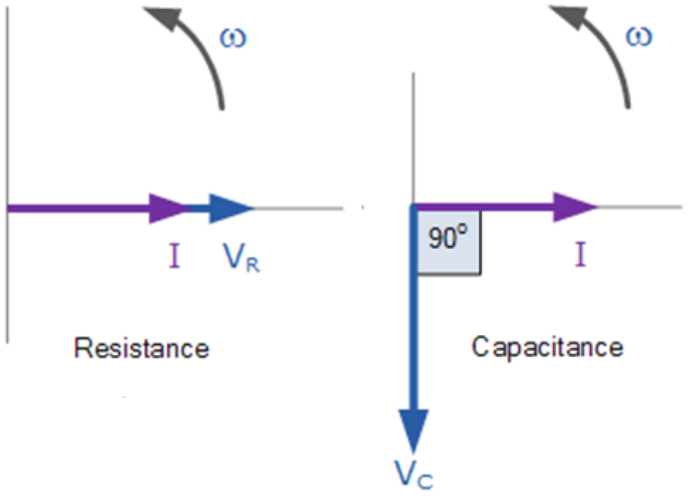


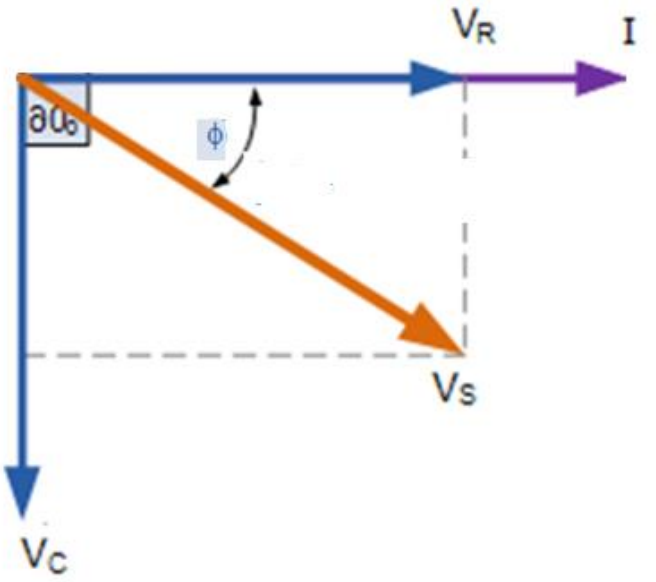
RC series circuit



RC series circuit

Individual Voltage Vectors





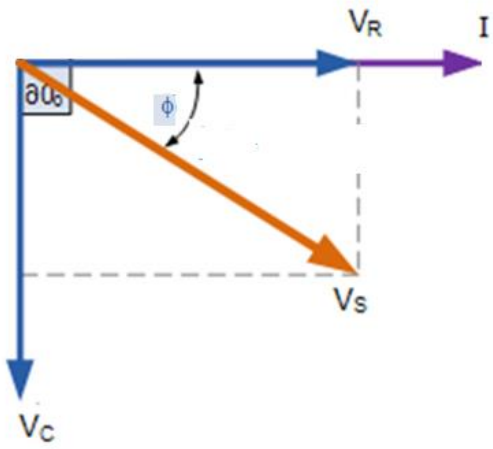
RC series circuit

$$V_R = I.R \quad V_C = -jI.X_C$$

$$V_S = \sqrt{(I.R)^2 + (I.X_c)^2}$$

$$V_S = I.\sqrt{R^2 + (X_c)^2}$$

$$\therefore V_S = I \times Z \quad \text{where: } Z = \sqrt{R^2 + (X_c)^2}$$



RC series circuit

- Impedance
- Phase diagram
- Impedance triangle
- Power factor
- Power