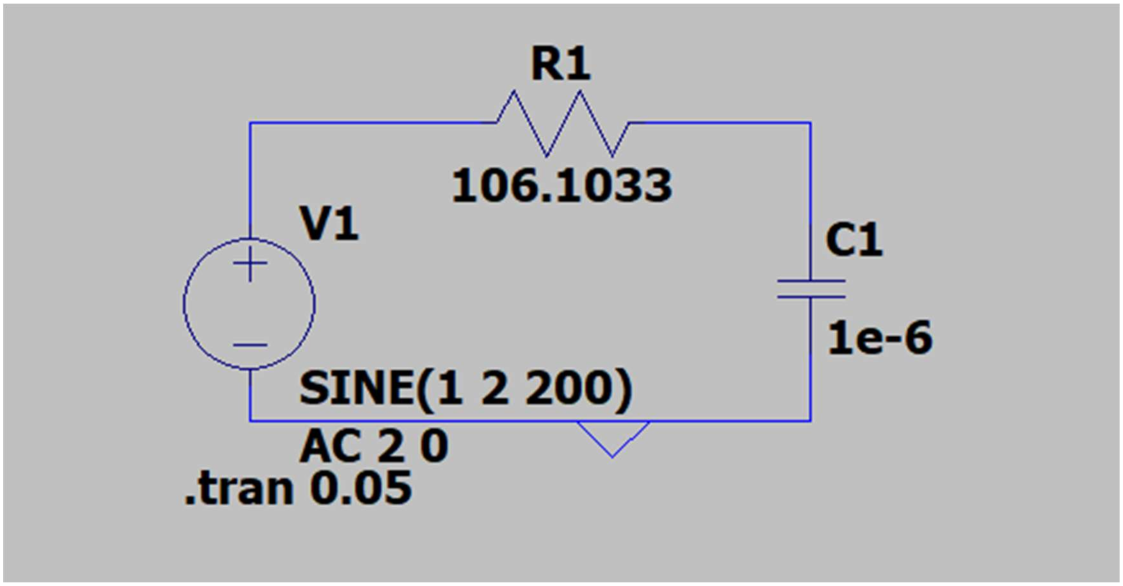
Low pass filter (RC)

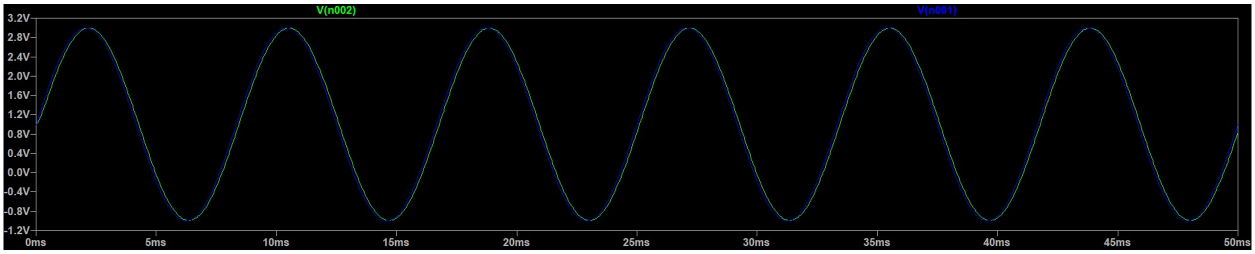
An RC filter uses a resistor and a capacitor to allow certain frequencies of a signal to pass while reducing others. In a low-pass RC filter, low-frequency signals pass and high-frequency signals are attenuated. In a high-pass RC filter, high-frequency signals pass while low-frequency and DC components are blocked. The frequency at which the filtering action begins is called the cutoff frequency and depends on the values of R and C. The output voltage is measured across the capacitor



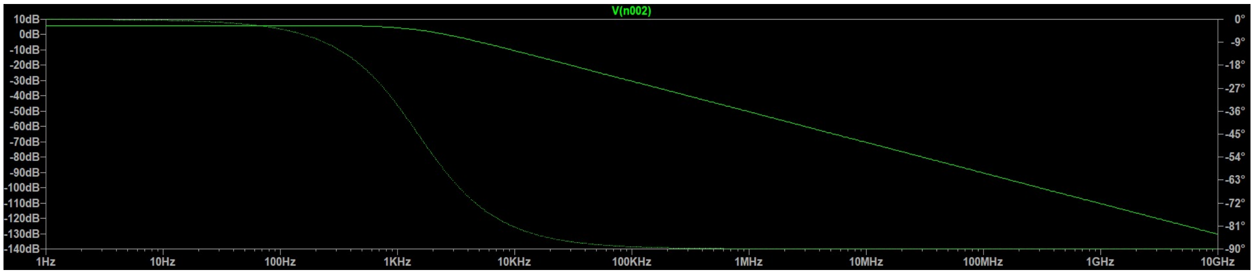
Cutoff frequency: It is the frequency at which the output voltage magnitude drops to 70.7% of the input voltage or when the gain is -3dB of the max value.

$$f = \frac{1}{2\pi RC} = \frac{1}{2\pi \times 106.1033 \times 10^{-6}} = 1kHz$$

Simulation Waveform:

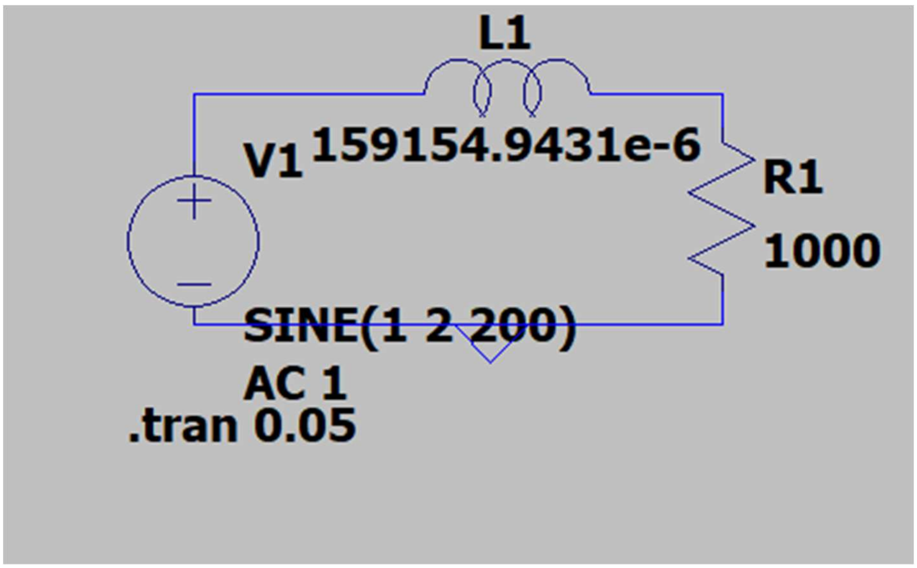


Bode plot:



Low Pass Filter(RL):

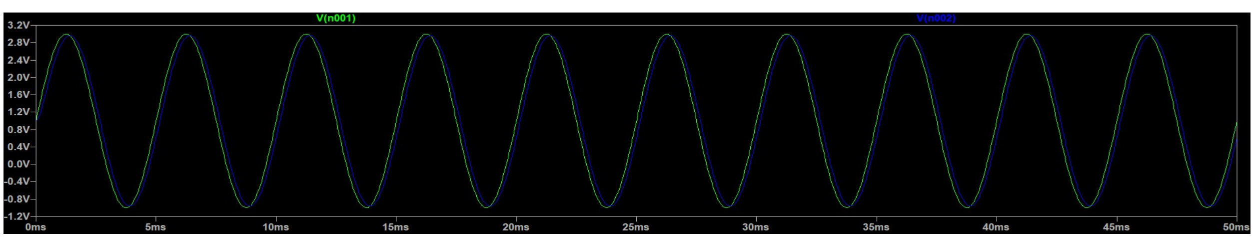
An RL filter uses a resistor and an inductor to allow certain frequencies of a signal to pass while reducing others. In a low-pass RL filter, low-frequency signals pass and high-frequency signals are attenuated because the inductive reactance increases with frequency. At low frequencies, the inductor offers very little opposition to current, so the signal appears at the output. At high frequencies, the inductor offers high reactance, reducing the output voltage. The frequency at which the filtering action begins is called the cutoff frequency and depends on the values of R and L. The output voltage is measured across the resistor.



Cutoff frequency: It is the frequency at which the output voltage magnitude drops to 70.7% of the input voltage or when the gain is -3dB of the max value.

$$f = \frac{R}{2\pi L} = \frac{1000}{2\pi \times 159154.9431 \times 10^{-6}} = 1kHz$$

Simulation Waveform:



Bode plot: