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Analog Electronics Lab #6 – Study and design of active filters using LM741

Objectives

To study the following active filters using op-amp LM741

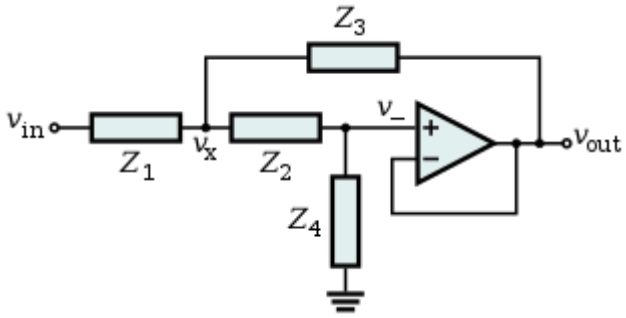
1. Low Pass Filter
2. High Pass Filter
3. Band Pass Filter

and find out

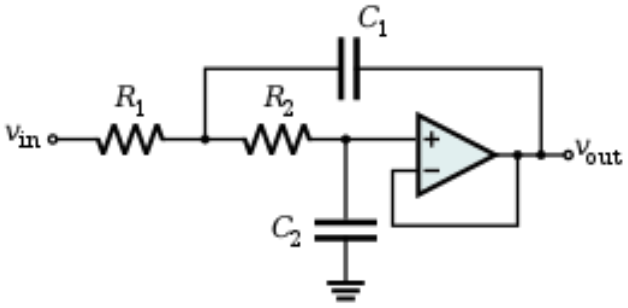
a) Plot of voltage gain vs frequency (Bode Plot) for all three different filters,
b) Calculate 3dB frequency and compare it with simulation in a tabular format.

Also draw the schematic for each filter.

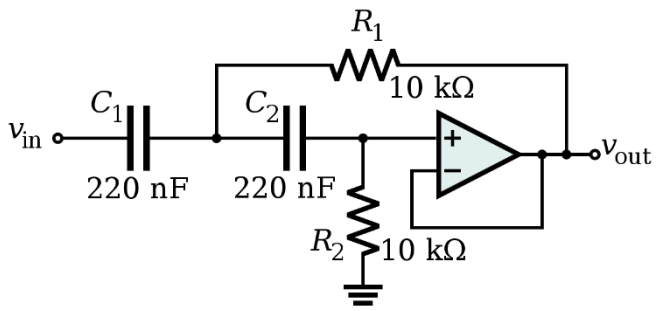
Sallen-Key filters (Active filters)



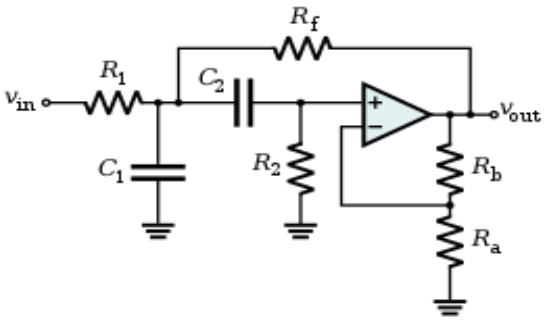
Sallen-Key topology



Sallen-Key Low Pass filter



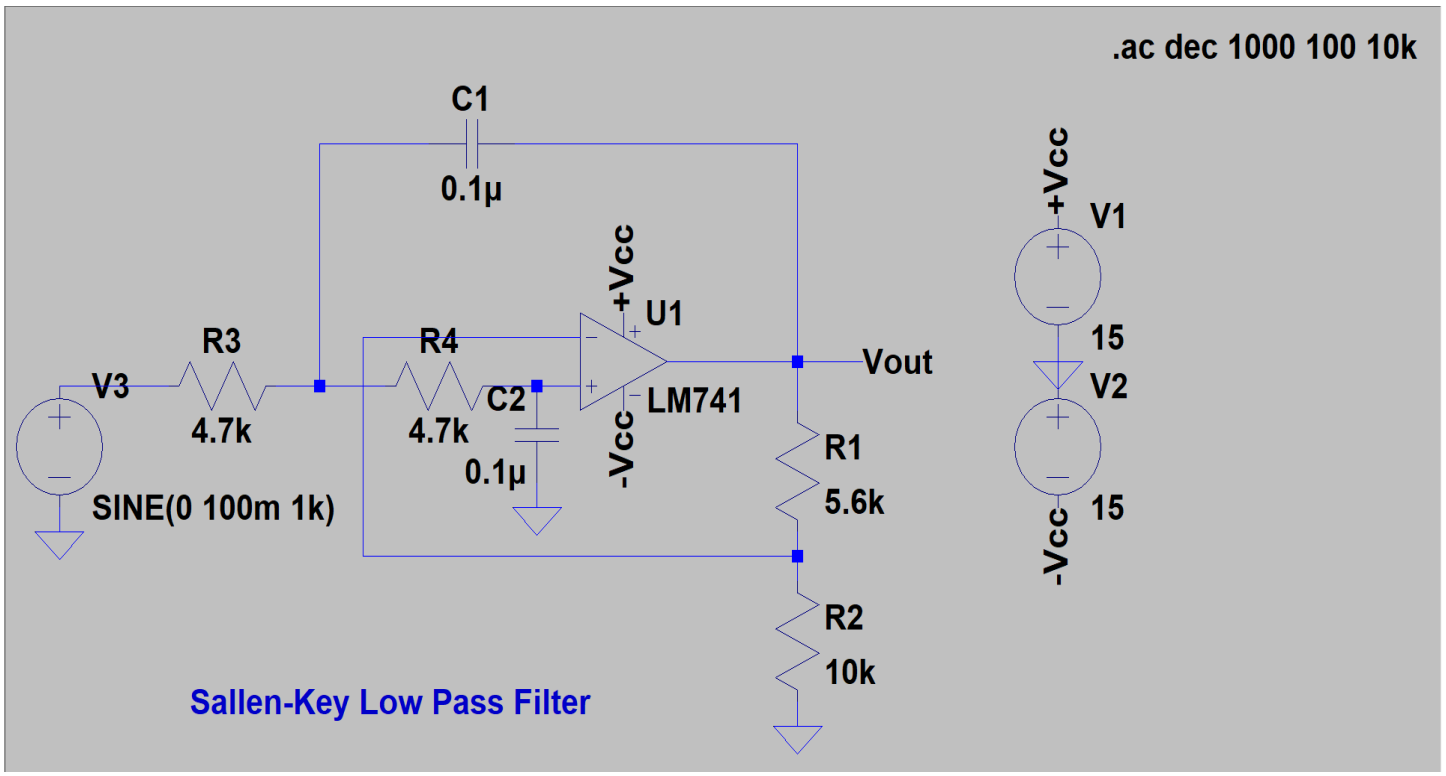
Sallen-Key High Pass filter

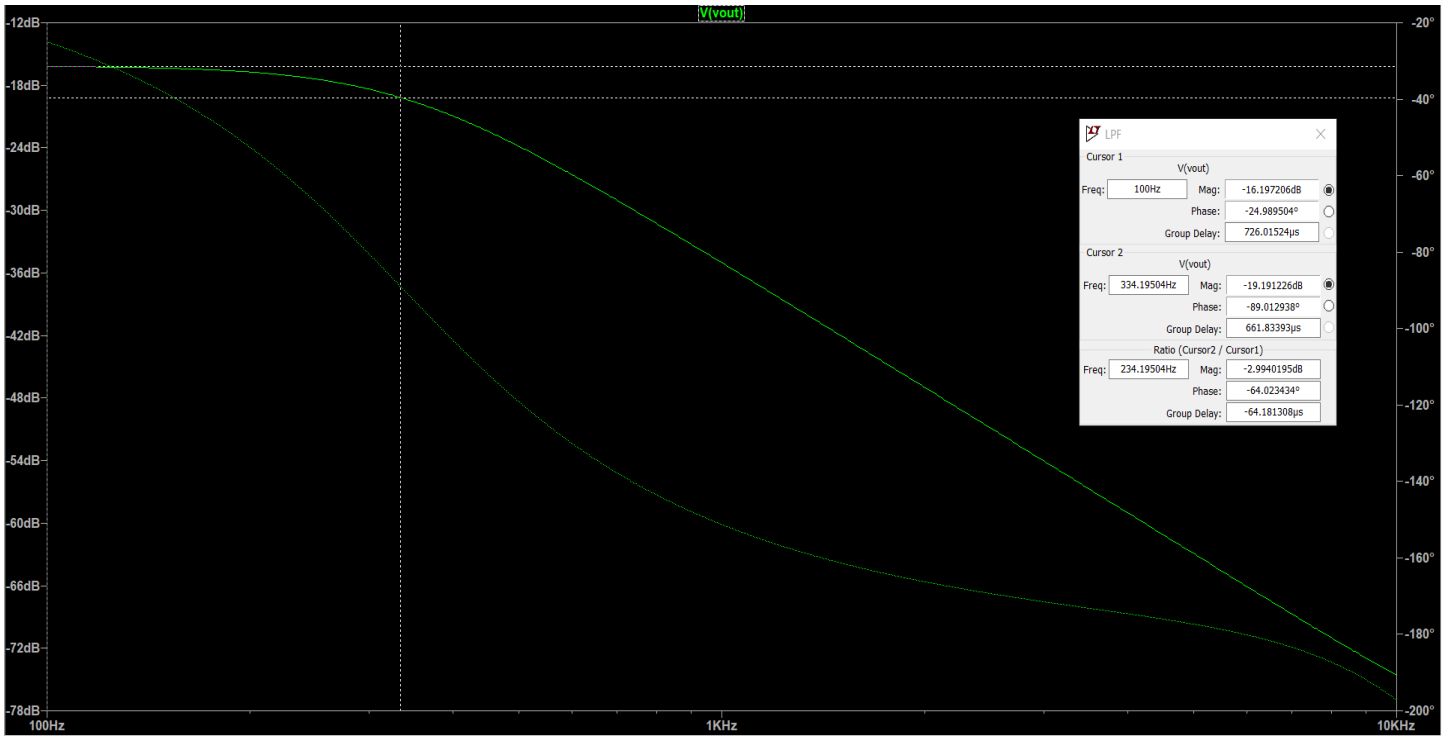


Sallen-Key Band Pass filter

Low Pass Filter

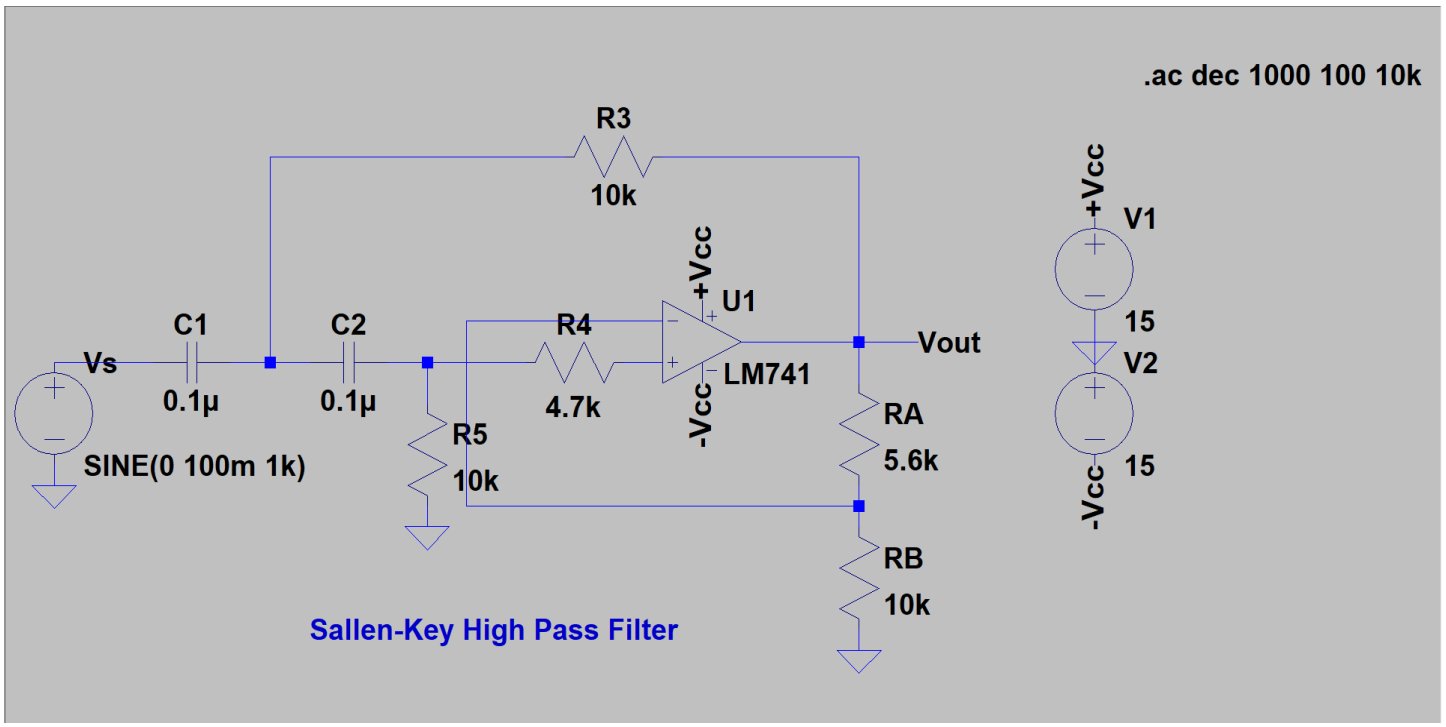
Schematic and frequency response plot

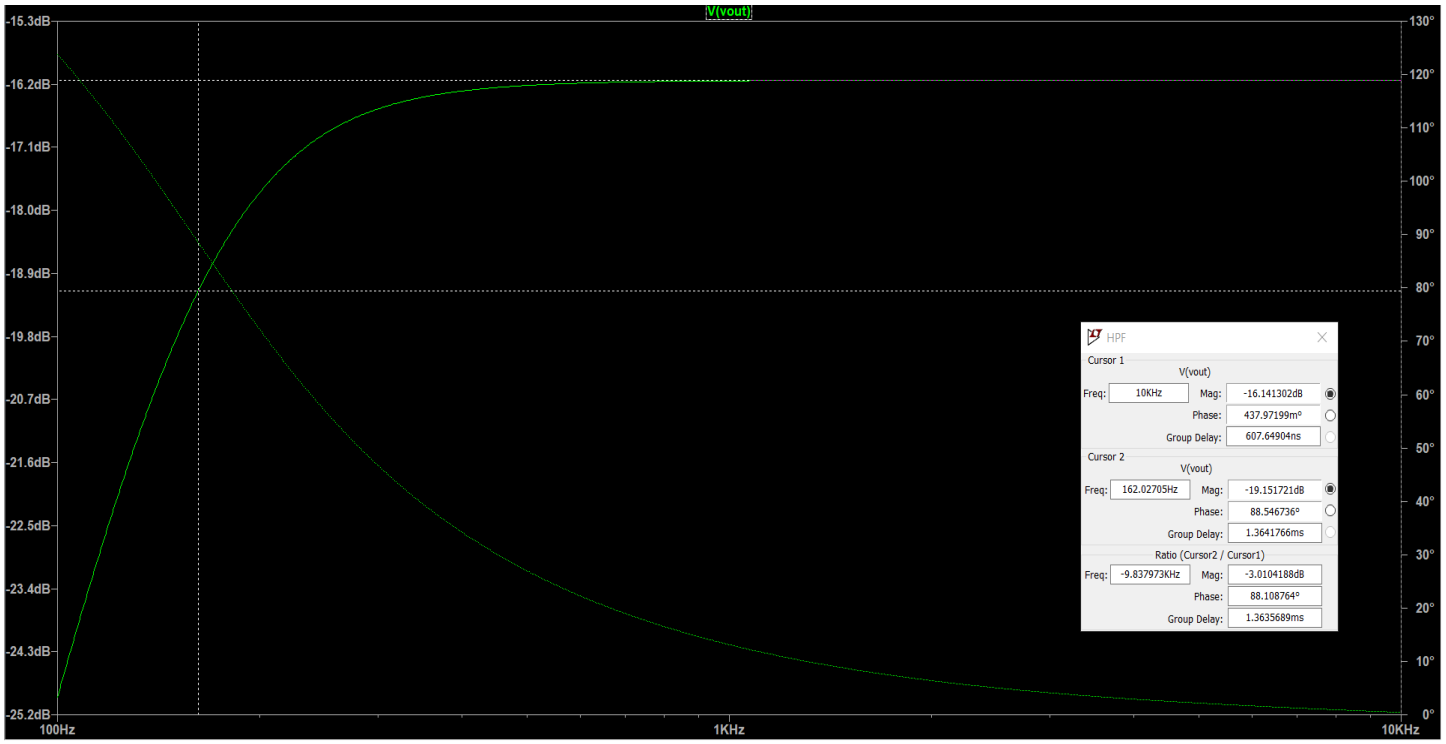




High Pass Filter

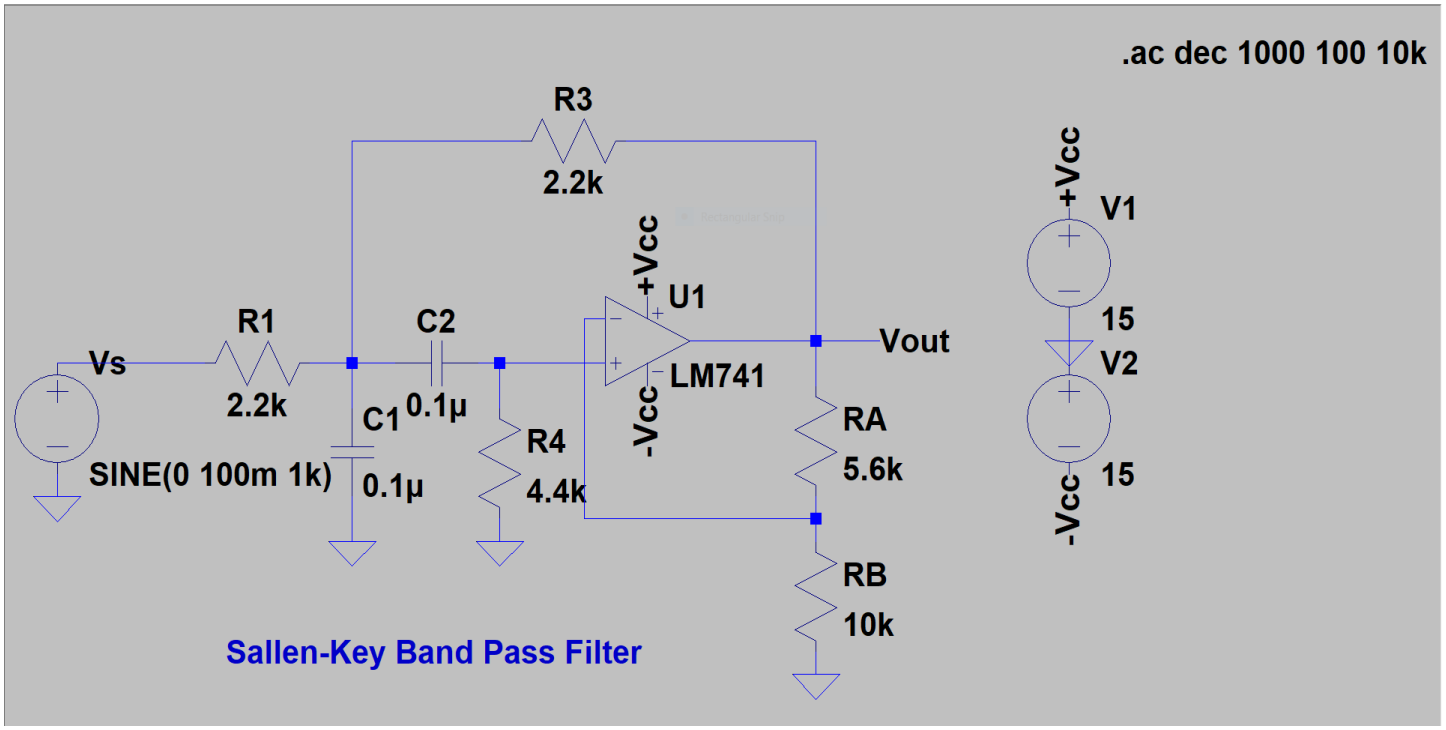
Schematic and frequency response plot

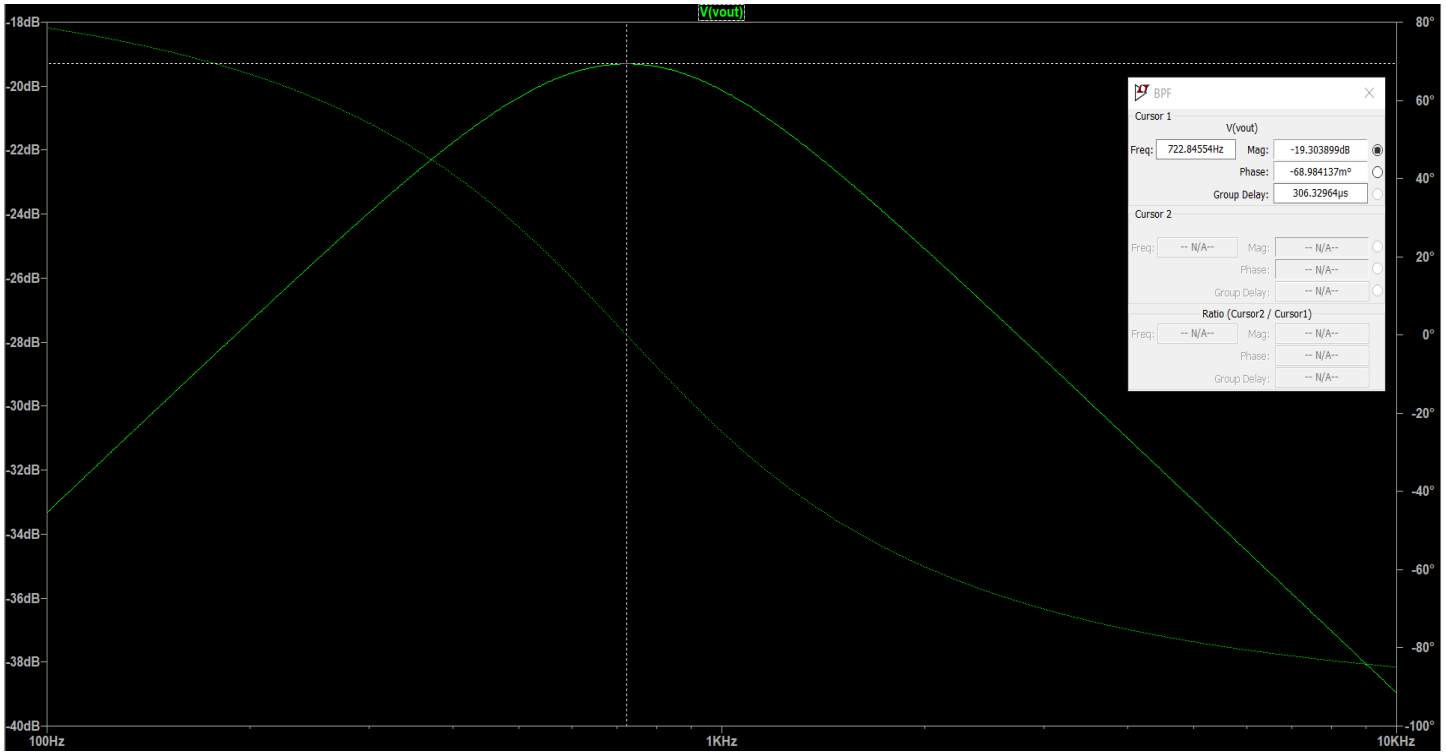




Band Pass Filter

Schematic and frequency response plot





Results

Comparison of simulated and theoretical values of 3dB/cutoff frequencies:

Type of filter	Theoretical value of 3dB/cutoff frequency	Simulated value of 3dB/corner frequency
Low pass filter	$\frac{1}{2\pi RC} = \frac{1}{2\pi \times 4.7k \times 0.1u} = 338.627\ Hz$	334.195 Hz
High pass filter	$\frac{1}{2\pi RC} = \frac{1}{2\pi \times 10k \times 0.1u} = 159.155\ Hz$	162.027 Hz
Band pass filter	$\frac{1}{2\pi RC} = \frac{1}{2\pi \times 2.2k \times 0.1u} = 723.432\ Hz$	722.846 Hz