REQUIREMENTS NOT MET

- All requirements were met.

PROBLEMS ENCOUNTERED

- No problems were encountered.

INTRODUCTION

In Lab 9, we explore low and high pass RC filters. We also define differences between active and passive filters.

DISCUSSION

9.5 Pre-Lab Requirements:

9.5.1 LTSpice Simulations:

1. Review AC Analysis in LTSpice
2. Build a simple lowpass filter, Figure 9.2a, but set R = 10 k Ohm and C = 0.001 μF. Set the voltage source to an AC amplitude of 1 and run an AC analysis with the following settings: Decade, 100, 1, 1Meg. Save an image of the circuit, a plot of the output, and table the 3 dB frequency for submission.

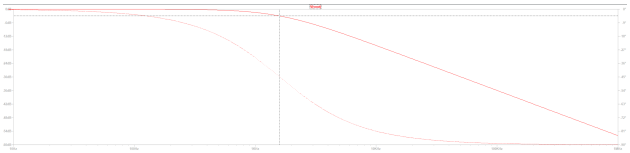

Figure 1: Plot of Low Pass Filter

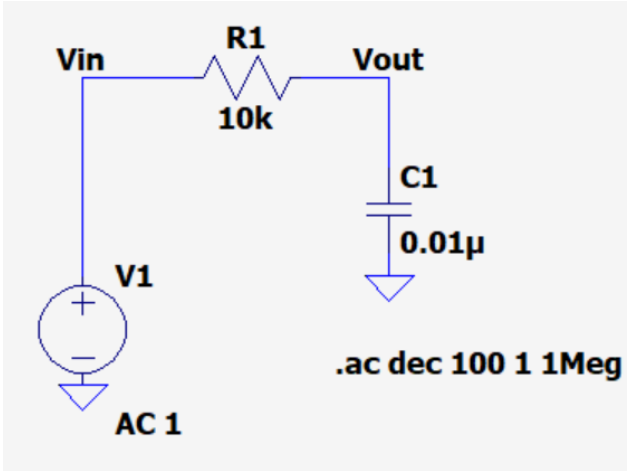

Figure 2: Circuit of Low Pass Filter

LOW-PASS	1.6 kHz	45 deg

3. High Pass Filter

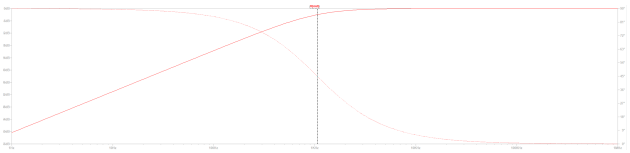

Figure 3: Plot of High Pass Filter

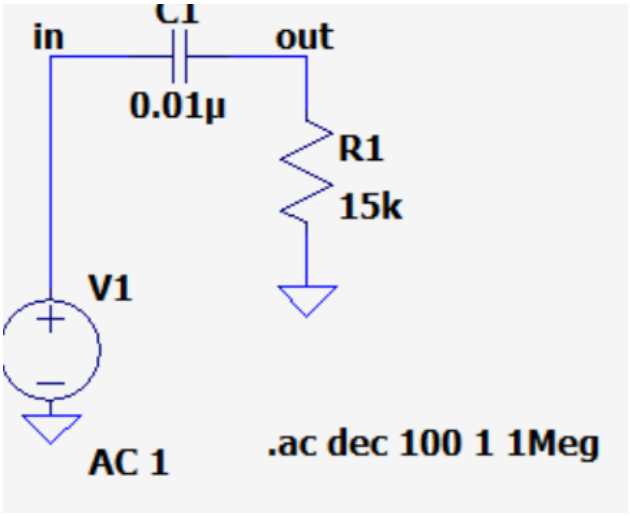

Figure 4: Circuit of High Pass Filter

HIGH-PASS	1.063 kHz	45 deg

4. Active Low Pass Filter with $R = 1k\Omega$ and $C = 0.1\mu F$

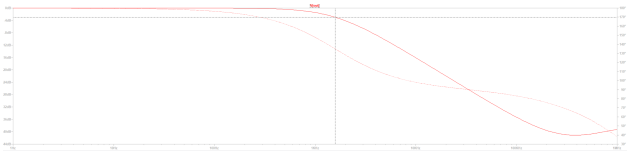

Figure 5: Plot of Active Low Pass Filter

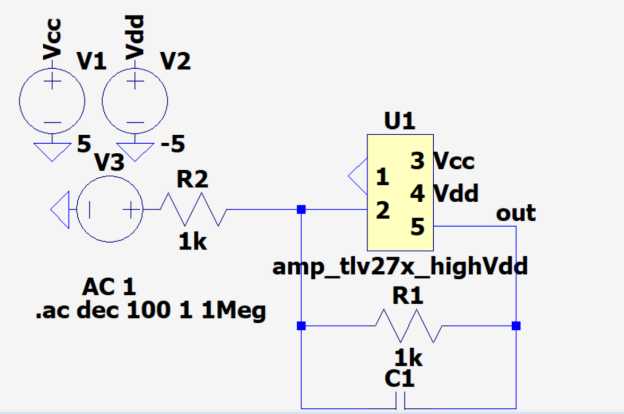

Figure 6: Circuit of Active Low Pass Filter

ACTIVE LOW-PASS	1.59 kHz	45 deg

5. Active High Pass Filter with $R_1 = 3.3k\Omega, R_2 = 33k\Omega$ and $C = 0.1\mu F$

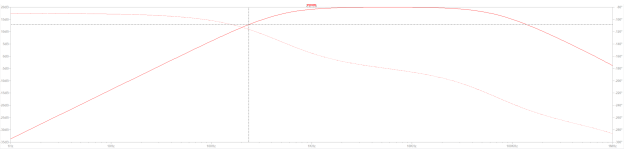

Figure 7: Plot of Active High Pass Filter

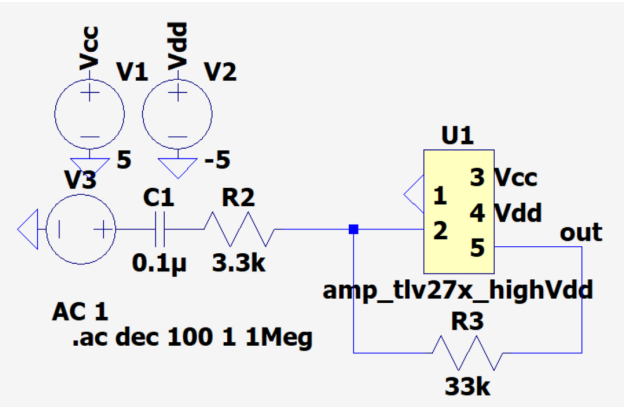

Figure 8: Circuit of Active High Pass Filter

ACTIVE HIGH-PASS	482.3 Hz	45 deg

9.5.2 Breadboard Implementation:

1. Review Network Analyzer tool in Digilent Waveforms.
2. Build Active Low Pass Filter with $R = 1k\Omega$ and $C = 0.1\mu F$.
3. Network Analysis of Circuit

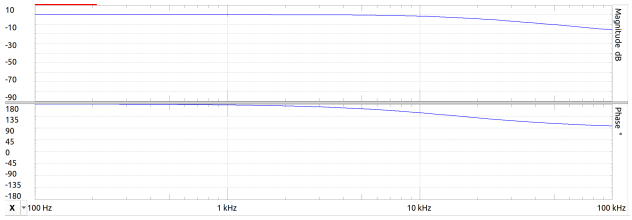

Figure 9: Plot of Active Low Pass Filter

9.7 Write-Up:

	Low-Pass	High-Pass	Active Low-Pass	Active High-Pass
Simulated	16 kHz	1.063 kHz	1.59 kHz	482.3 Hz
Actual	15.674 kHz	1.035 kHz	1.593 kHz	460.9 Hz
Percent Error	2.03%	2.63%	0.1%	4.44%

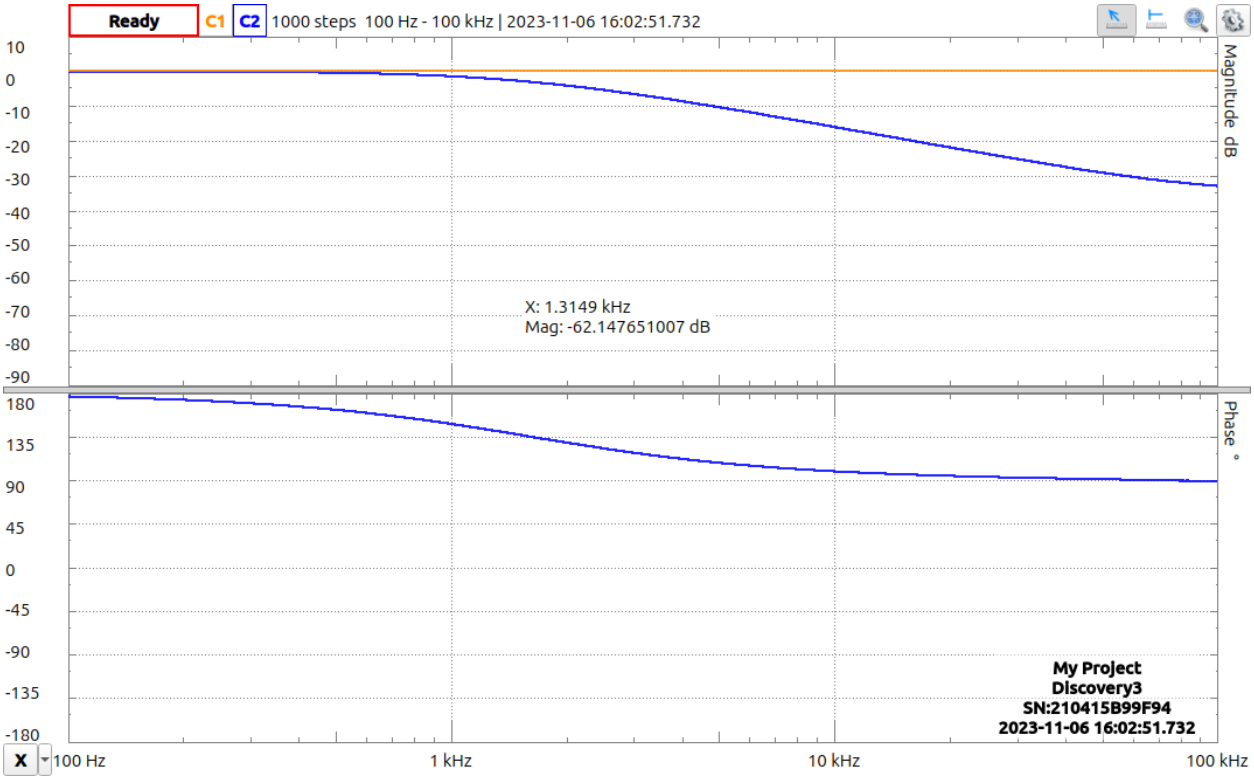

Figure 10: Passive Low Pass Filter

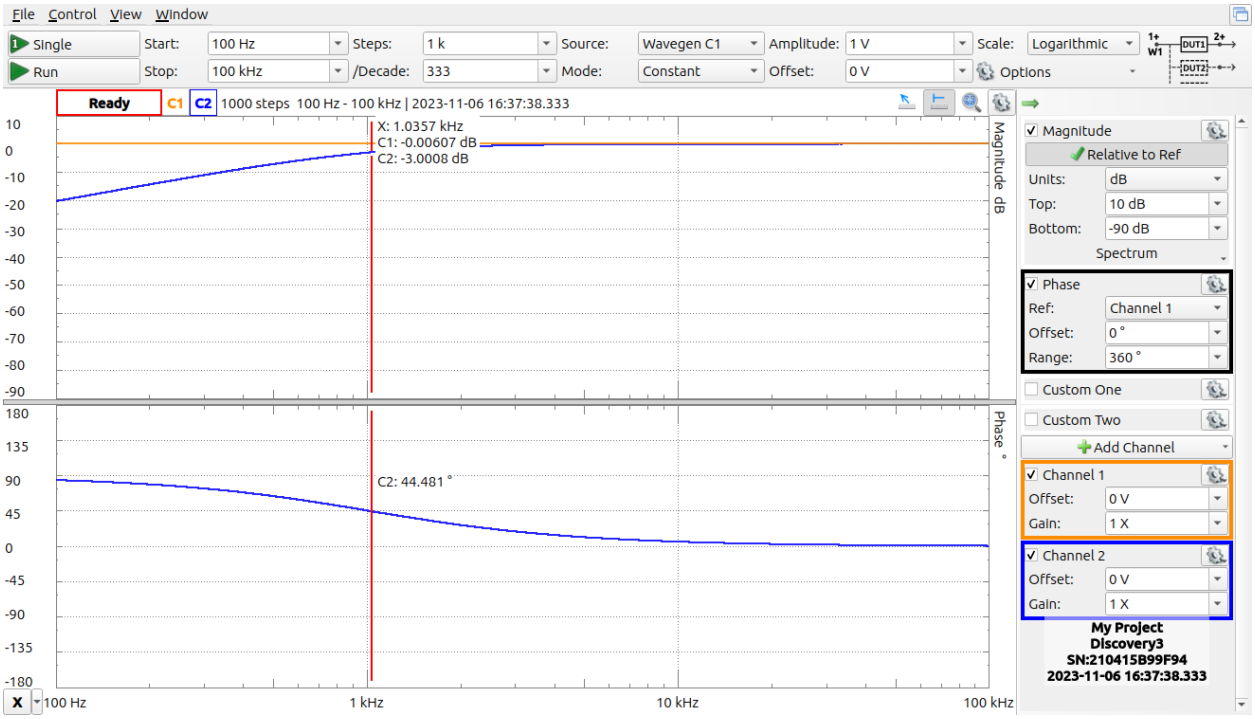

Figure 11: Passive High Pass Filter

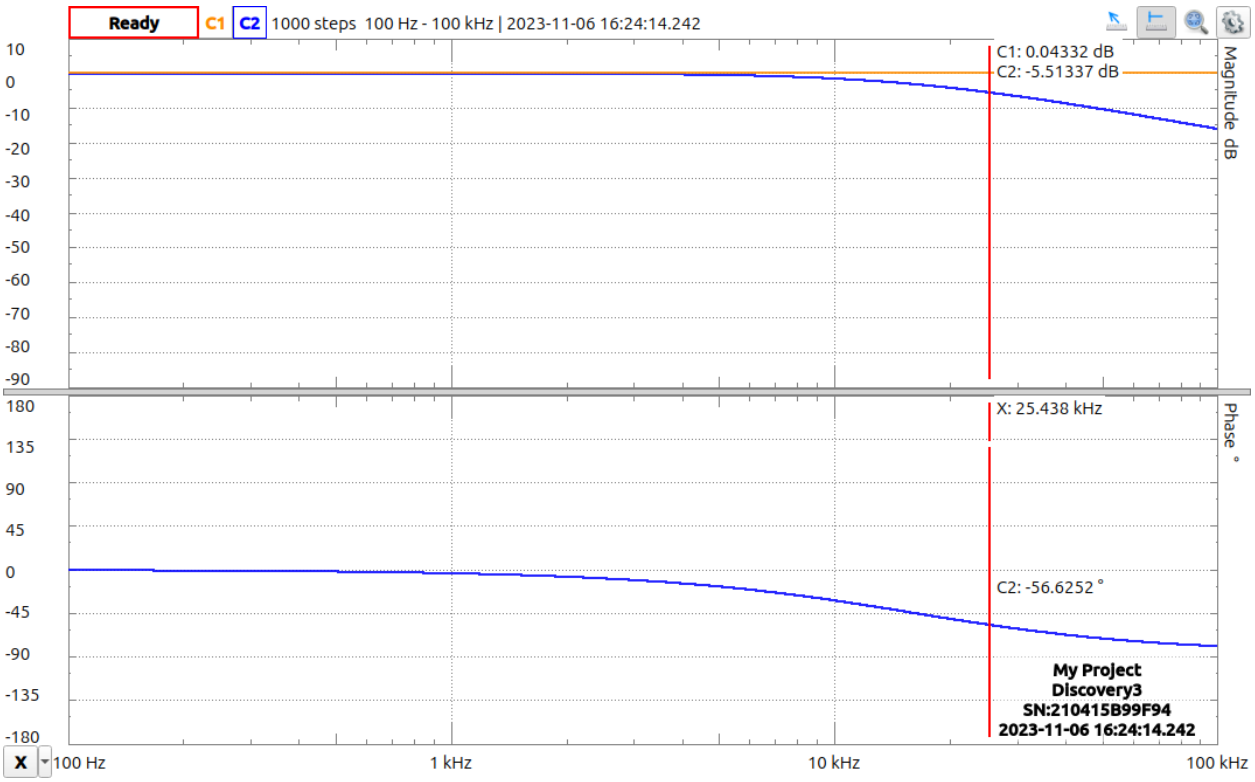

Figure 12: Active Low Pass Filter

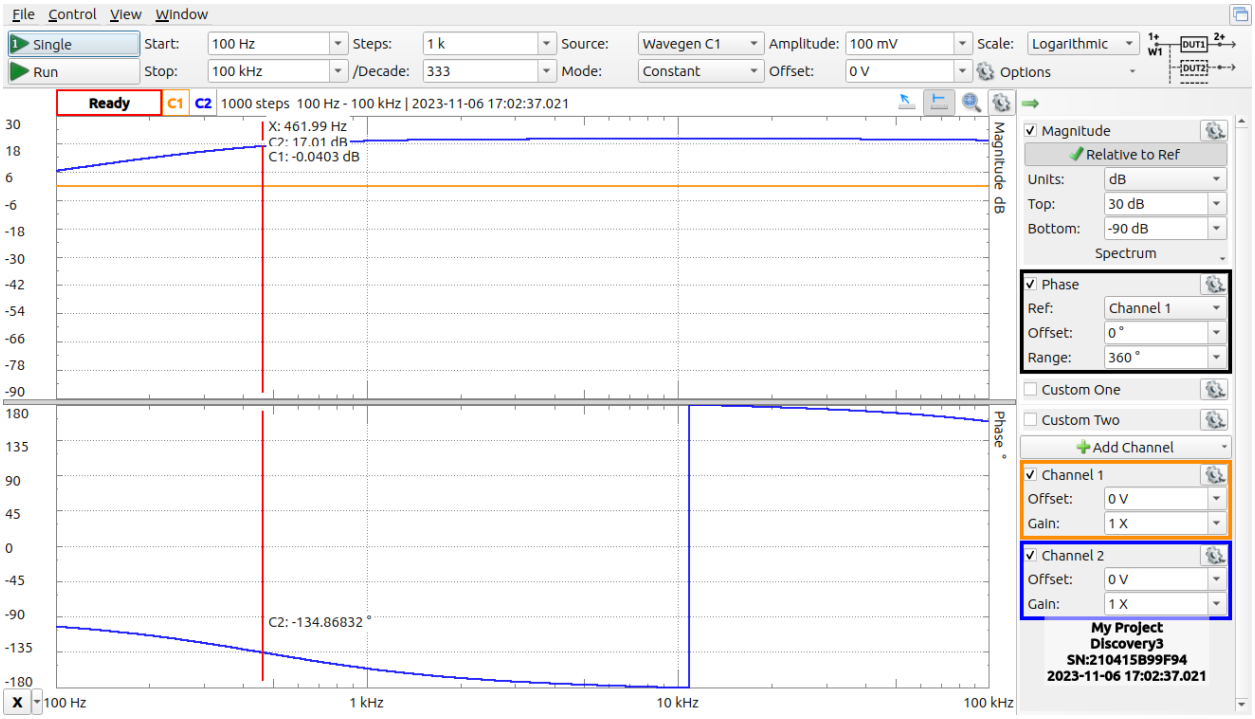

Figure 13: Active High Pass Filter

CONCLUSION

The purpose of lab 9 is to explore the working characteristics of RC filters. However, we explore how to create active filters which can create a gain and a filter in one amplifier. As we can see from the previous section, our physical circuits worked within a 5% tolerance of simulated values.