

# VE311 Electronic Circuits

## Lab 05: Op-Amps

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Laboratory is focused on to understand a few of the things seen in class. In this practice, the operational amplifier is going to be tested. Basically, it is the key applications for basic science. Whole set of equations, carrier mobility, Q-point, bias at triode, operation in either as a logic gate or amplification, among quite a few others lies within this device that as a matter of a bitter sweetness, it is another milestone for nowadays technology. The Op-Amp is basically a massive array of, among others quite a few transistors such as *npn* & *pnv*, diodes, resistors, capacitors (inductors are quite difficult to either reduce or pack with the others passive devices), sources, etc. Basically, it is the key applications for basic science. In Advance ask for which are the Op-Amps that the lab has or if possible use TL084 (old but works, very well).

1. The first circuit that we're going to test is a rather simple amplifier as shown in Fig. 1

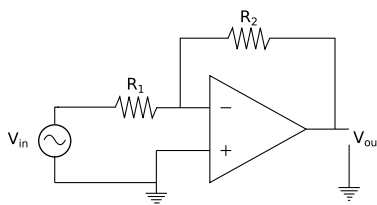


Figure 1: Basic configuration

The relationship that you're going to analyze is the amplification of a  $V_{in}=1$  V and the output should be: 1, 5, 10 and 20 V. For a separated experiment, change the source for a sinusoidal one with  $V_{in}=2$  V and output 10 V, with a frequency variation for 100 Hz, 500 Hz, 5 kHz, 100 kHz, 2 MHz, 10 MHz and 30 MHz.

2. For the second circuit, a filter or filters are in order to be analyzed, as shown in Figs. 2a & b simulate and fabricated. Figure shows the diagram of the filter that is required to be analyzed.

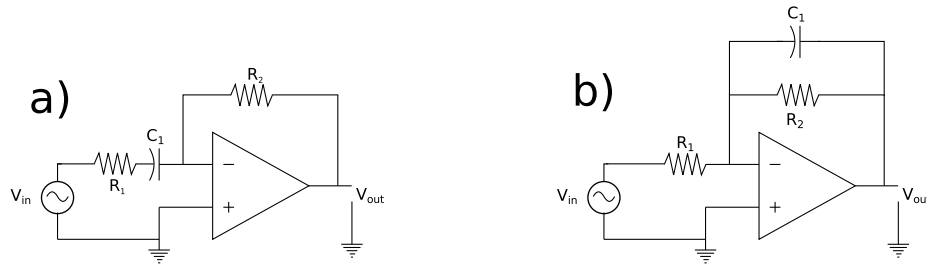


Figure 2: Basic configuration for active filters. a) High-pass filter and b) low-pass filter

Calculate the right values for capacitors and resistors in order to get the follow cut-off frequencies: 2 kHz, 10 kHz and 1 MHz.

For each one of the experiments you need to obtain images from the oscilloscope, in which you show the key variations of the experiment. Support your images with appropriate explanation as well as numerical analysis and simulations by using SPICE. Each group must submit a report. Be aware of your safety and your team mates.