LABORATORY EXPERIENCE: DESIGN WITH OPERATIONAL AMPLIFIERS

The goal of this experience is to introduce concepts of design and testing of circuits based on specifications.

SECTION 1. The design process

Using a single Op Amp design a non-inverting voltage amplifier with the following specifications:
- Gain: Adjustable by the user between 0.5 and 15 (values within +/- 10% are acceptable)
- Input Impedance ($Z_{in}$) higher than 20 kΩ (values within +/- 10% are acceptable)

Explain and comment on the design steps in your lab report.

SECTION 2. Testing circuit specifications

- Use a DC signal at the input to verify that the gain of the circuit complies with the specifications for gain and input impedance. In your lab report, explain the method that you used to measure the gain of the circuit as well as its input impedance.

SECTION 3. AC Circuit characterization

Set the DC gain of the circuit to 10

- Change the input voltage to a sinusoidal signal at approximately 1 kHz
- Verify the gain of the circuit is still 10
- Measure the clipping voltages (positive and negative) for your amplifier. Explain how you do this. Record and explain your results in your lab report.
- Measure the Gain (Magnitude and Phase) vs. Frequency characteristic of your amplifier over a wide range of frequencies. In your lab report justify the frequencies that you used. Include the data in a table in your lab report, for example:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Vin</th>
<th>Vout</th>
<th>Gain</th>
<th>Time delay</th>
<th>Phase</th>
</tr>
</thead>
</table>

- Include also as graph created by using the appropriate software.
- Is the gain constant over all the frequency range? Why?

SECTION 4. Laboratory report

- Create an individual lab report using the guidelines provided in the course’s website. Don’t forget to describe and explain all the methods that you have used to measure the different parameters in addition to your numerical results. The measuring method is as important as the measured values

- The work that you have done in this laboratory experience is probably different than what you have done in the past, mostly based on building a circuit given to you by the instructor and taking values on this circuit. Please comment on the difficulties and challenges of this laboratory work (i.e. what worked, what did not work, what you liked, what you didn’t like, etc.). Be assured that the grade for your laboratory work or your course will not be affected at all by your positive or negative comments.