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| NUIM_logo (Hi-Quality) | **National University of Ireland, Maynooth** Department of Electronic Engineering  EE204: Analog Electronics |

## Title: The Operational Amplifier - Filters

## Number: 6

**OBJECTIVE**

This lab will introduce you to the op-amp filter

### PROCEDURE

The circuit that you are using will be the LM741 op-amp, first introduced in 1968 by Fairchild Semiconductor . It has since been copied by many others. The pin-connection diagram for the 741 is shown below.

VCC is the positive voltage supply (+15 volts)

VEE is the negative voltage supply (-15 volts)

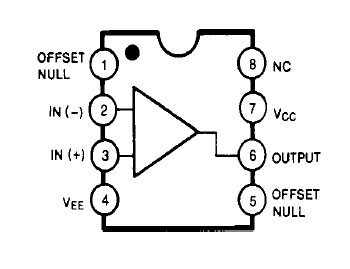
IN- is the MINUS input

IN+ is the PLUS input

OUTPUT is the output

The other pins do not need to be connected unless there is a problem

NC stands for no-connection.



# Part 1: Low Pass Filter

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Implement the above circuit with a 1 kΩ resistor and a 1 µF capacitor (or similar value).

Using a 1 volt (peak-to-peak) sine wave, measure the output amplitude of the signal.

Plot a chart of gain for a frequencies in the range 10 Hz to 10 MHz.

Comment on your graph.

# Part 2: Another Low Pass Filter

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Take your previous circuit and add a 10 kΩ resistor in parallel with the capacitor.

Repeat your measurements and draw the chart of gain versus frequency.

The graph should be different, explain the change.

# Part 3: High Pass Amplifier

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Implement the above circuit with a 1 kΩ resistor and a 1 µF capacitor (or similar value).

Using a 1 volt (peak-to-peak) sine wave, measure the output amplitude of the signal.

Plot a chart of gain for the frequencies in the range 10 Hz to 10 MHz.

Comment on your graph.

# Part 4: Oscillator

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Construct the above circuit using the following values

R1 = 10 kΩ R2= 10 kΩ

R = 1 kΩ C = 100 nF

Measure the maximum voltage swing that VPLUS makes.

What is the frequency of the square wave output

REQUIRED RESULTS IN REPORT

* A brief introduction showing you know what the lab is about (3-4 lines MAX)
* For each section you need the following
  + - A drawing of the circuits used
    - Your results, including sketches or photographs of waveforms
    - Answer all questions asked
    - Comments and opinions on results or methods used
* Conclude your report with a summary section which may include any additional conclusions you may have.

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| **Marks will be deducted for poorly presentation, poorly written reports.**  **Marks will only be awarded for sections completed.** |