Software, hardware needs

- Signal generator & Multimeter with GPIB interface
  - 34405 DMM
  - Agilent 33220A Function Generator
  - Agilent Multimeter 3458A
- LabVIEW 2017
- Wires to measure

Key concepts to learn

1. GPIB interface
2. Installing Drivers for LabVIEW
3. Creating Vis for instruments
4. RMS, Vp, VPP
5. Frequency and period
6. Filter characterization
7. Automation and measurements

Part I:

1. Make sure you have installed the drivers for each instruments.
2. Create the VI to communicate with each instrument.

Part 2:

1- Configure the function generator:

   a. STORE/RECALL → set to default →YES

   b. UTILITY→ Output setup → High Z → Done

   c. Set OFFSET =0.

   d. Press OUTPUT

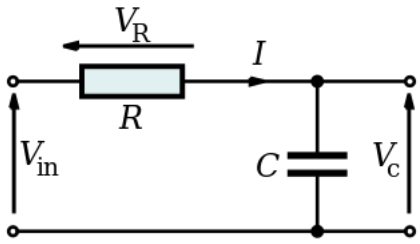
2- On the DMM set VAC.

3- Complete the table below manually. Note that you can find the output voltage from the signal generator (Vout) using the formula for V_RMS. Also, note that the DMM reads the Vas which is equivalent to V_RMS

Signal Generator 33220A			Multimeter(DMM)-V_RMS		Scope		Calculate V from V_RMS*
Signal	Freq	Vout	Vac	Freq.	Vpp	Freq.	Vout
Sine	1K	2V					
Sine	1K	4V					
Sine	2K	2V					
Sine	2K	4V					
Sqr	1K	2V					
Sqr	1K	4V					
Sqr	2K	2V					
Sqr	2K	4V					

*Note that Vac=[SRT(2)/2]Vpp=V_RMS.

PART III:



4- Build the circuit as shown in the figure

5- Using Matlab plot the response. Show the cutoff frequency on your plot. The plot must be V-f.

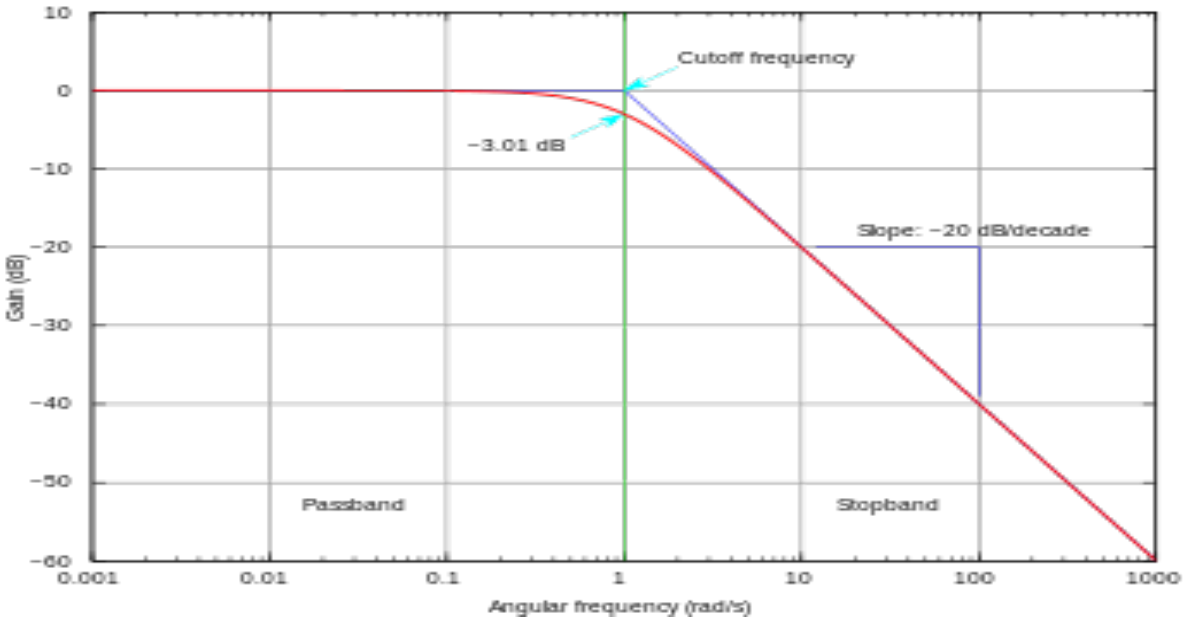
$$G_C = |H_C(j\omega)| = \left|\frac{V_C(j\omega)}{V_{in}(j\omega)}\right| = \frac{1}{\sqrt{1+(\omega RC)^2}}$$

6- Calculate the cutoff frequency: 1/(2Pi*RC).

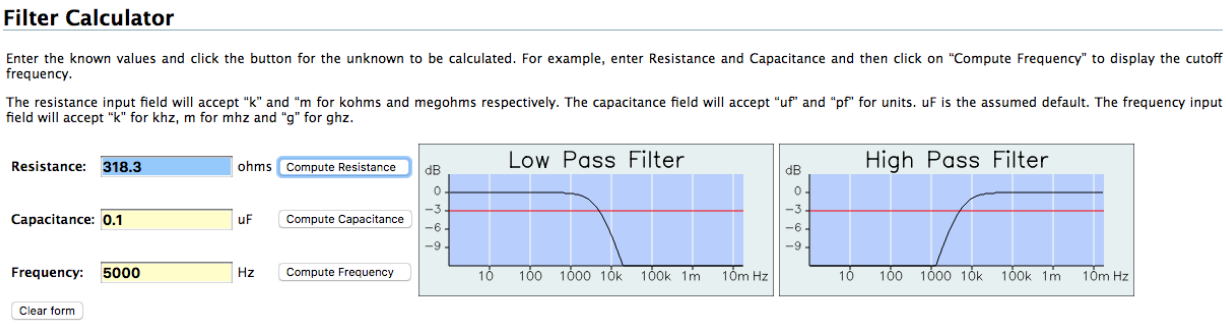
7- Explain the significance of -3dB point.

8- Draw the circuit using a schematic capture.

9- Connect the function generator and the DMM together.

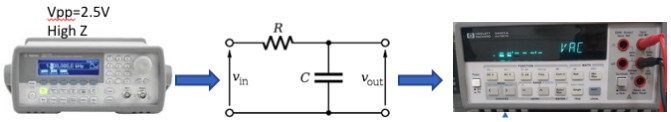


Design example:
(https://www.experimentalistsanonymous.com/ve3wwg/doku.php?id=rc_simple_filter)



Part IV:

Build a LP filter. Calculate the center frequency of your filter. Then, manually find the center frequency of the filter.



fc=_____

R=_____ C=_____

Using the table below measure the actual center frequency and plot the results. You need to measure **20 frequency points**.

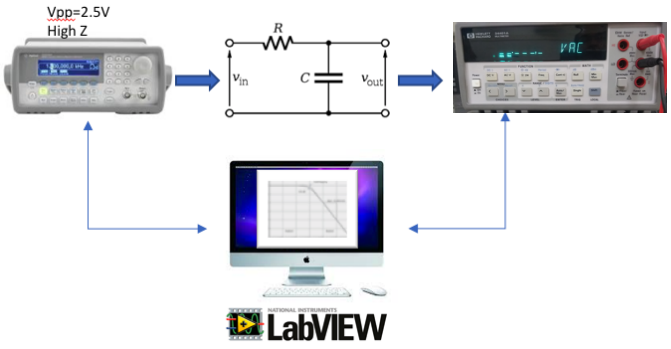
Signal Generator			Multimeter(DMM)		Calculate*		
Signal	Freq	Vpp (Vin)	Vac	Freq.	Vout	Vout/Vin	(Vout/Vin)dB
Sine	100	4V					
Sine	150	4V					
Sine	250	4V					
Sine	300	4V					
Calculated fc=_____							

Part IV:

At this point let's find the center frequency using LabVIEW. of the filter. You should save all the tested values in an excel file.

1- Plot all the measured values: Frequency against Vout

2- In your program the user must be able to define the Start, Stop, and Step frequencies on the front panel.



3- The program must measure the frequency at which cutoff frequency appears. Plot the results manually.