EECT 211 spring 2020

Lab partners Brian Yang, Caleb Barger, Jorge Silba

Professor Mr.Bell

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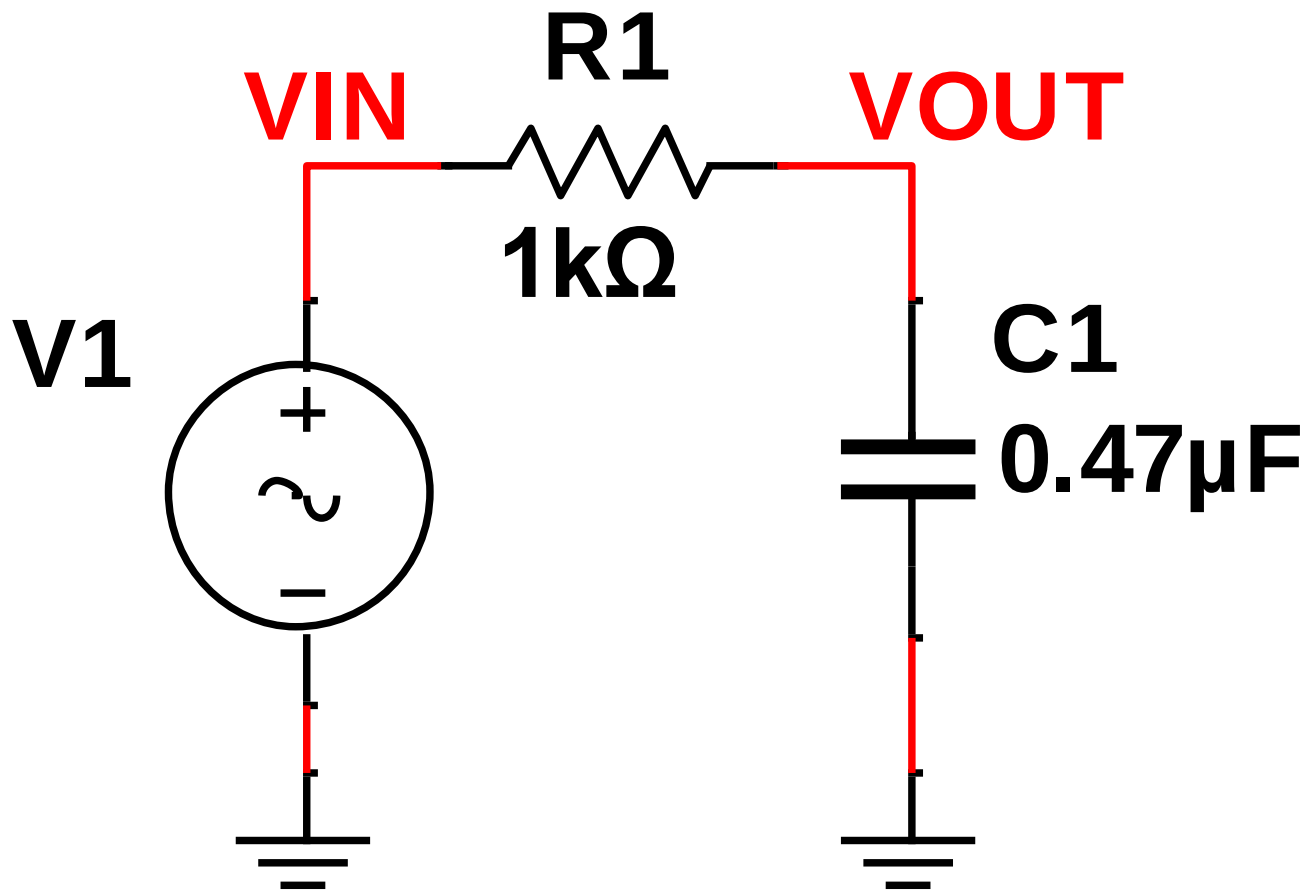
Redo Lab 11
RC circuit

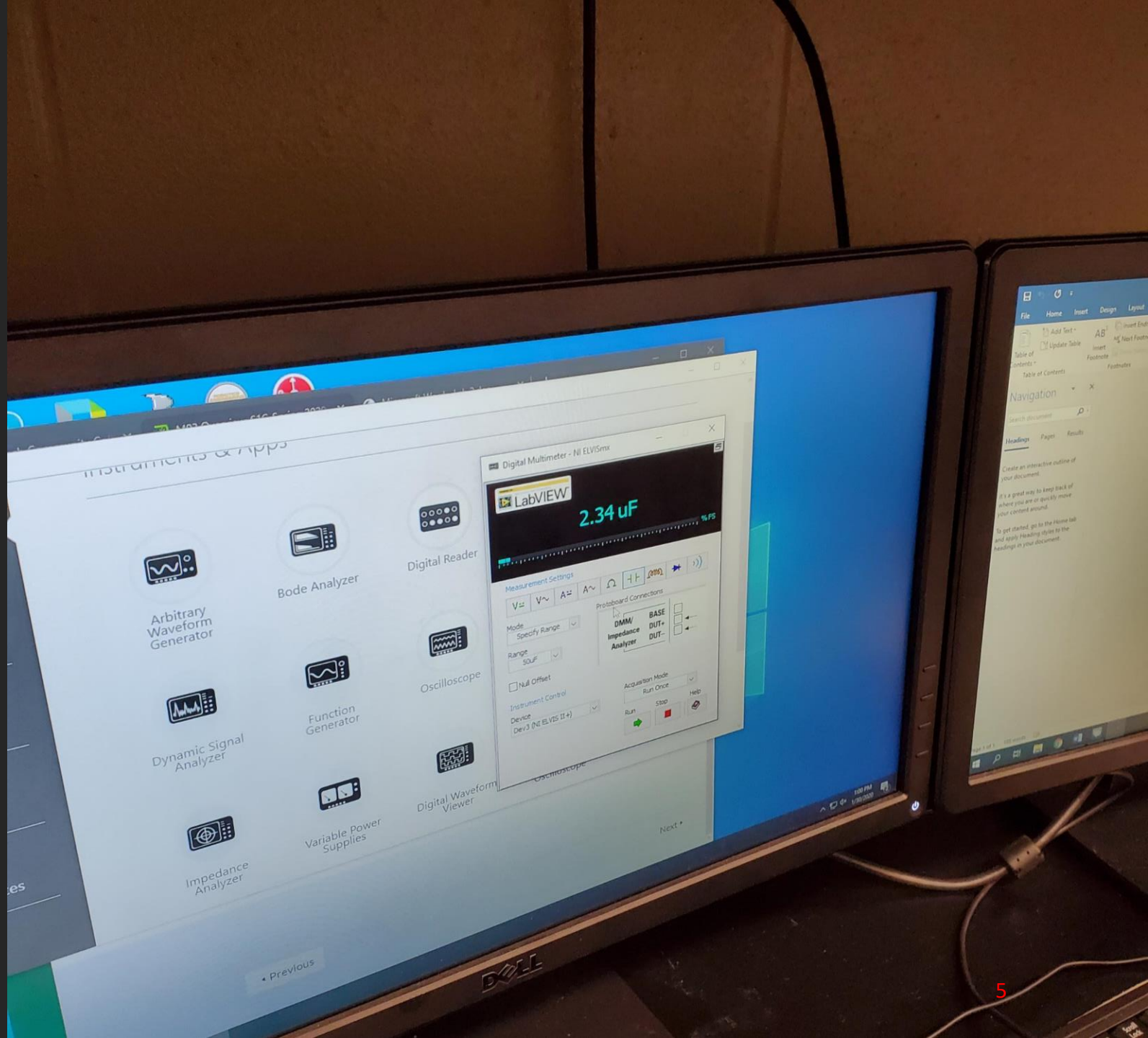


Objective

- Experiment with RC (Resistor & Capacitor) circuits.

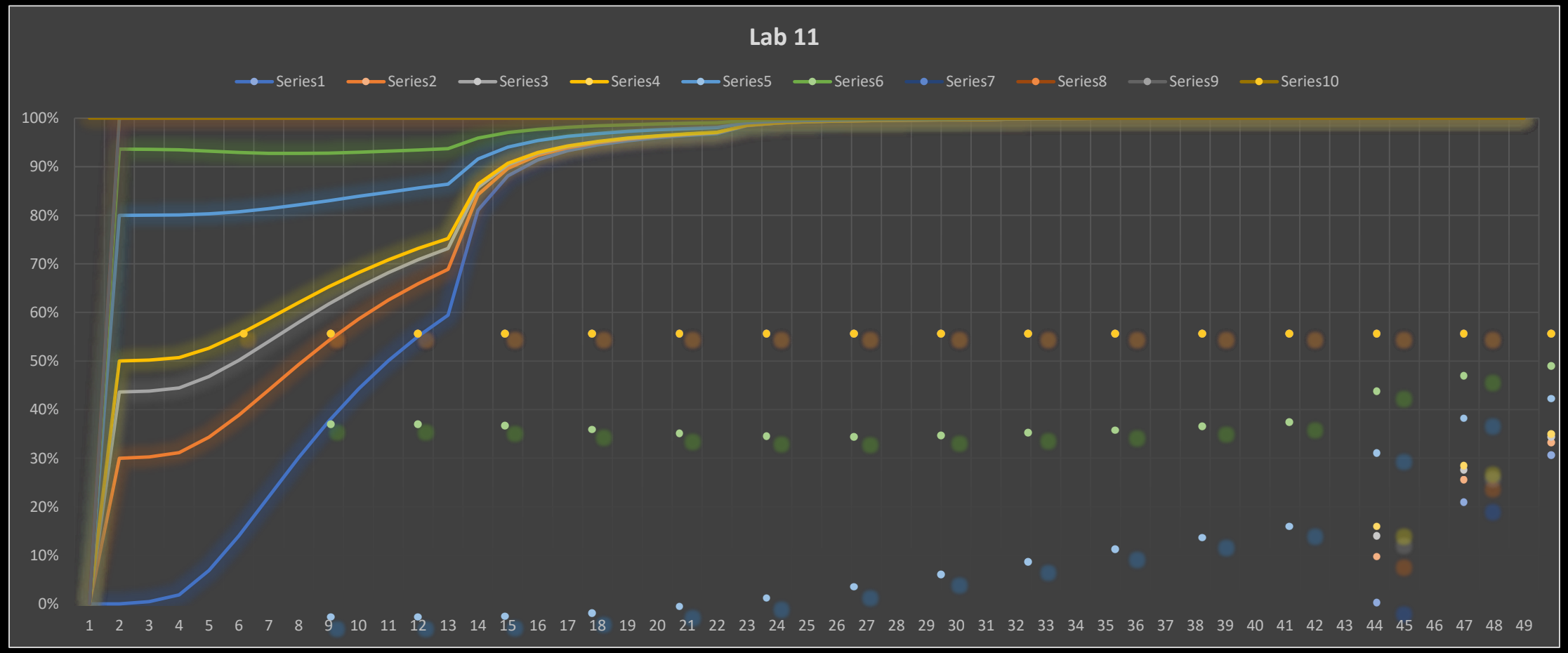
- The following capacitors are needed (1 each of the following): 0.47uF, 1uF and 2.2uF

Lab 11


Digital Multimeter - NI ELVISmx
LabVIEW
2.34 uF
Arbitrary Waveform Generator
Bode Analyzer
Digital Reader
Oscilloscope
Function Generator
Dynamic Signal Analyzer
Digital Waveform Viewer
Variable Power Supplies
Impedance Analyzer
Previous
Next

Lab 11

Capacitance

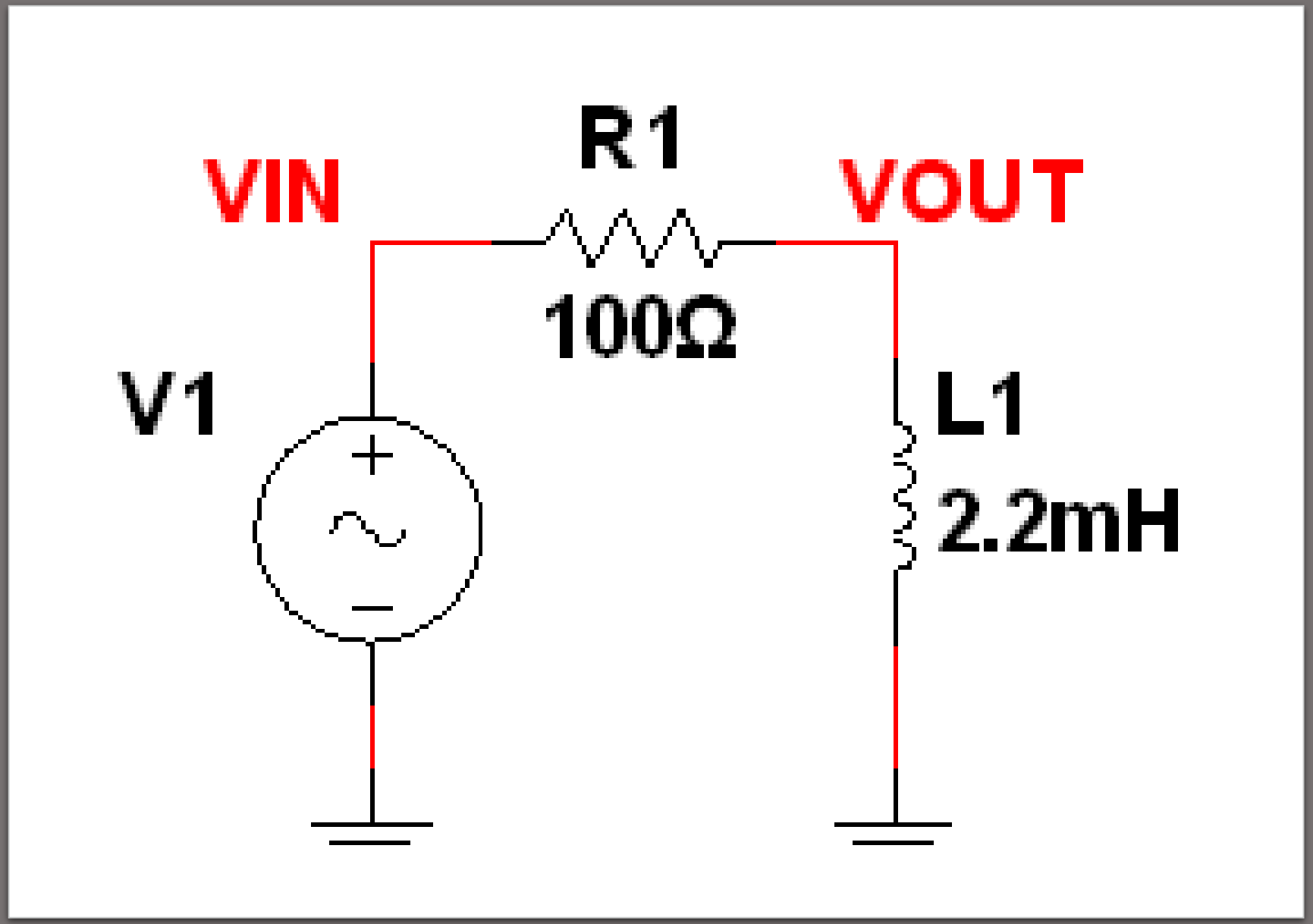


Lab 11 frequency response

C=	0.00000047		C=	4.7E-07	
V in=	1		V in=	1	
frequency	Xc=	V out	frequency	Xc=	V out
10	33862.75385	0.999564246	10	33862.75	0.999564
50	6772.55077	0.989274091	50	6772.551	0.989274
100	3386.275385	0.959055445	100	3386.275	0.959055
200	1693.137692	0.861035748	200	1693.138	0.861036
300	1128.758462	0.748508358	300	1128.758	0.748508
400	846.5688462	0.646126806	400	846.5688	0.646127
500	677.255077	0.560754907	500	677.2551	0.560755
600	564.3792308	0.491503956	600	564.3792	0.491504
700	483.7536264	0.435475335	700	483.7536	0.435475
800	423.2844231	0.389802061	800	423.2844	0.389802
900	376.2528205	0.352151235	900	376.2528	0.352151
1000	338.6275385	0.32073724	1000	338.6275	0.320737
2000	169.3137692	0.16693786	2000	169.3138	0.166938
3000	112.8758462	0.112163572	3000	112.8758	0.112164
4000	84.65688462	0.084355147	4000	84.65688	0.084355
5000	67.7255077	0.06757072	5000	67.72551	0.067571
6000	56.43792308	0.056348253	6000	56.43792	0.056348
7000	48.37536264	0.048318858	7000	48.37536	0.048319
8000	42.32844231	0.042290573	8000	42.32844	0.042291
9000	37.62528205	0.037598678	9000	37.62528	0.037599
10000	33.86275385	0.033843356	10000	33.86275	0.033843

Observations

- What we found out is that the Elvis dmm and oscilloscope does not work properly
- Other than that the rc circuit build was very similar to one that we did last semester

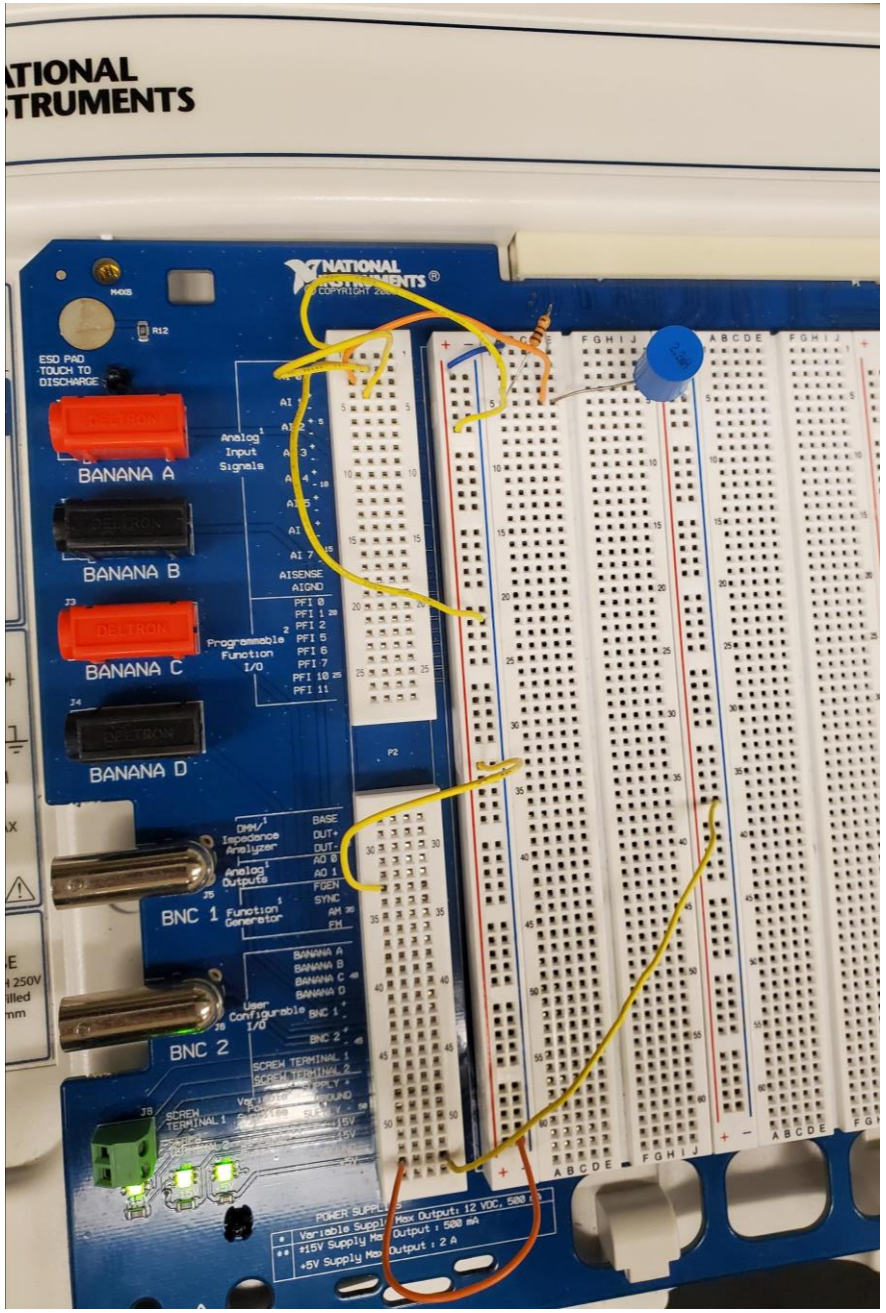


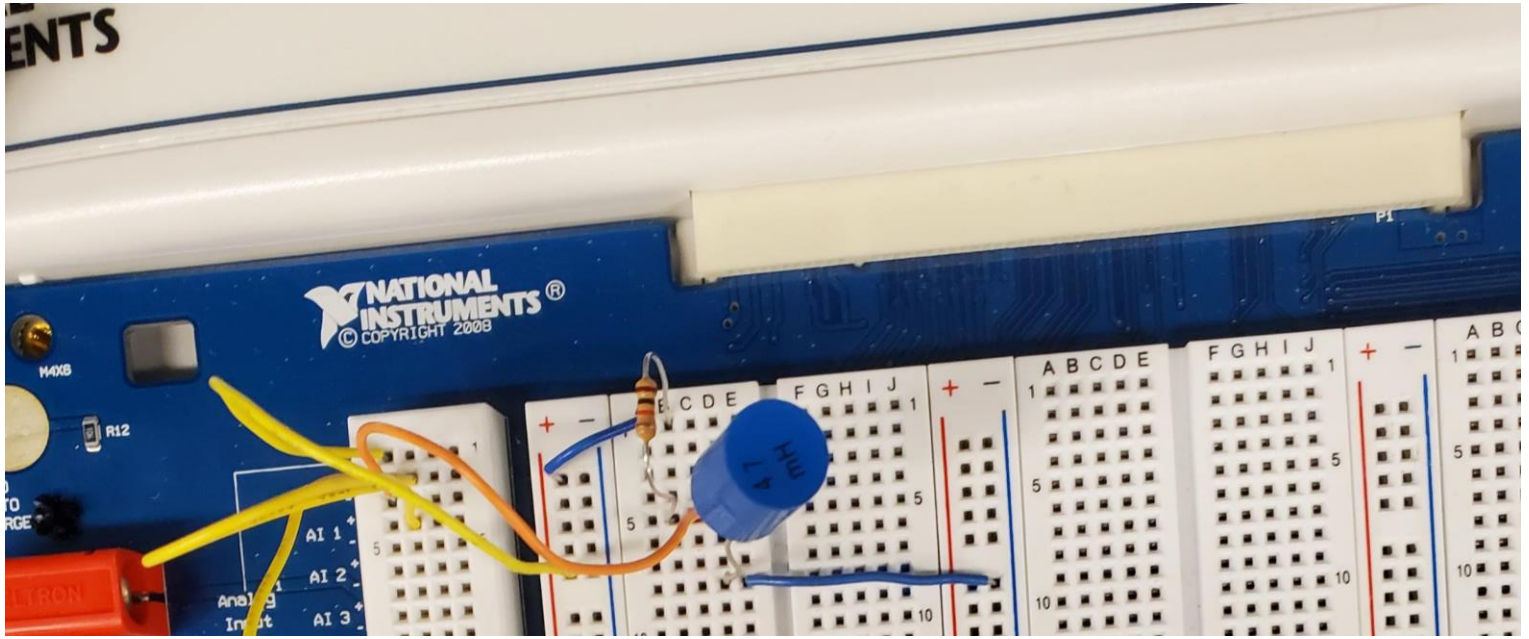
Redo Lab 13
RL circuit

Objectives

Experiment with RL (Resistor & Inductor) circuits.

The following inductors are needed (1 each of the following): 1mH, 2.2mH and 4.7mH

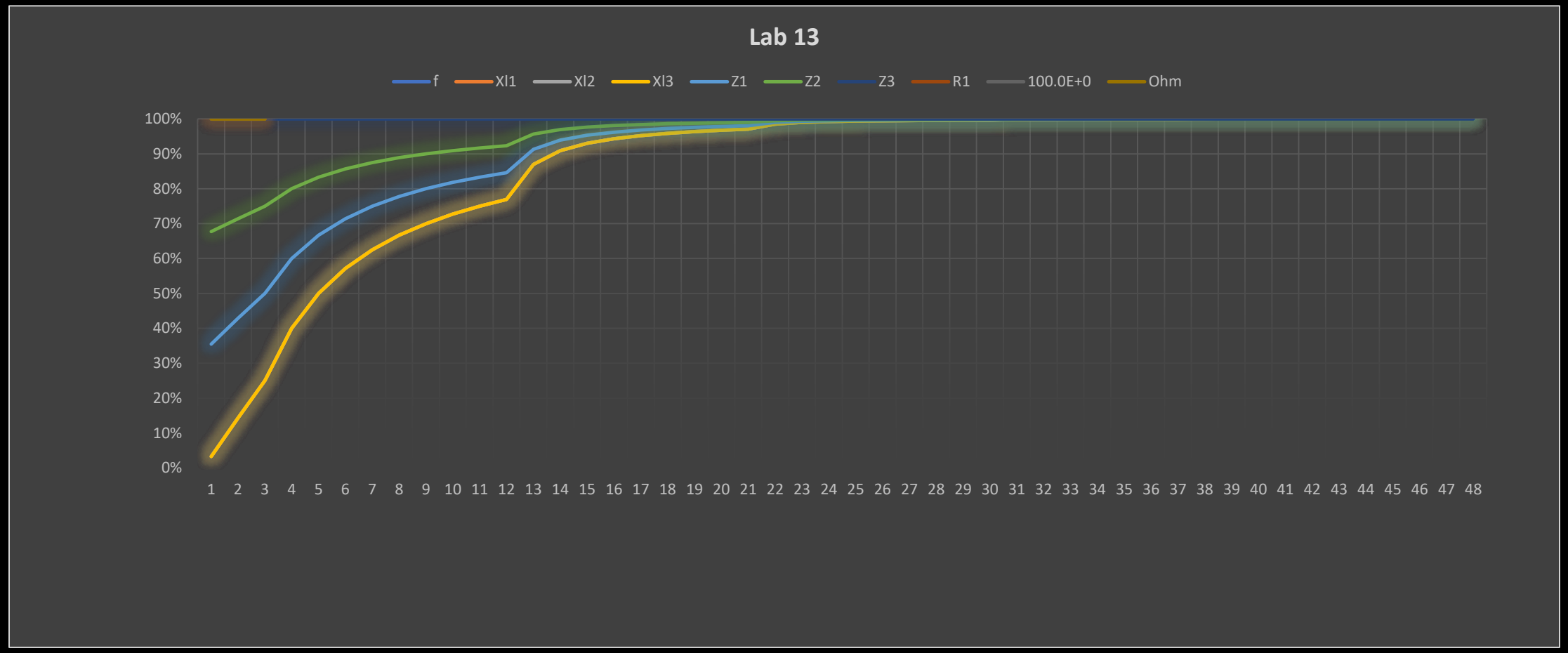

NATIONAL
TRUMENTS
ESD PAD
TOUCH TO
DISCHARGE
BANANA A
BANANA B
BANANA C
BANANA D
BNC 1
BNC 2
Analog
Input
Signals
Programmable
Function
I/O
DMM/
Impedance
Analyzer
Analog
Outputs
Function
Generator
User
Configurable
I/O
SCREW TERMINAL 1
SCREW TERMINAL 2
POWER SUPPLY


NATIONAL
INSTRUMENTS ®
© COPYRIGHT 2008
M4X8
R12
AI 1
AI 2
AI 3
A B C D E
F G H I J

Lab 13

Lab 13

Inductance

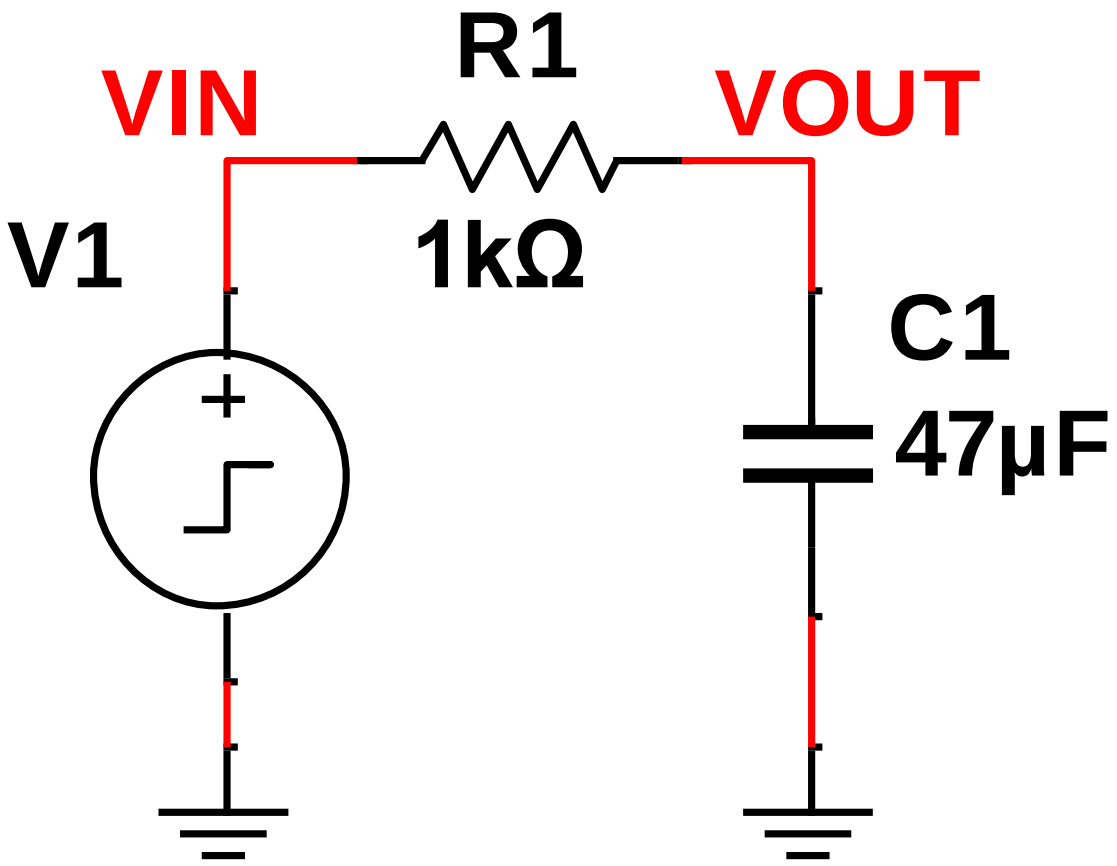


Lab 13 frequency response

		Frequenc				
F=	1.0E+3	y	XL	Z=	IT	vout
L=	2.2E-3	10	138.2E-3	100.000	10.0E-3	1.4E-3
R=	100.0E+0	20	276.5E-3	100.000	10.0E-3	2.8E-3
Vt	1	30	414.7E-3	100.001	10.0E-3	4.1E-3
		40	552.9E-3	100.002	10.0E-3	5.5E-3
		50	691.2E-3	100.002	10.0E-3	6.9E-3
		60	829.4E-3	100.003	10.0E-3	8.3E-3
		70	967.6E-3	100.005	10.0E-3	9.7E-3
		80	1.106	100.006	10.0E-3	11.1E-3
		90	1.244	100.008	10.0E-3	12.4E-3
		100	1.382	100.010	10.0E-3	13.8E-3
		200	2.765	100.038	10.0E-3	27.6E-3
		300	4.147	100.086	10.0E-3	41.4E-3
		400	5.529	100.153	10.0E-3	55.2E-3
		500	6.912	100.239	10.0E-3	69.0E-3
		600	8.294	100.343	10.0E-3	82.7E-3
		700	9.676	100.467	10.0E-3	96.3E-3
		800	11.058	100.610	9.9E-3	109.9E-3
		900	12.441	100.771	9.9E-3	123.5E-3
		1000	13.823	100.951	9.9E-3	136.9E-3
		2000	27.646	103.751	9.6E-3	266.5E-3
		3000	41.469	108.257	9.2E-3	383.1E-3
		4000	55.292	114.268	8.8E-3	483.9E-3
		5000	69.115	121.560	8.2E-3	568.6E-3
		6000	82.938	129.918	7.7E-3	638.4E-3
		7000	96.761	139.150	7.2E-3	695.4E-3
		8000	110.584	149.093	6.7E-3	741.7E-3
		9000	124.407	159.616	6.3E-3	779.4E-3
		10000	138.230	170.609	5.9E-3	810.2E-3

Observations

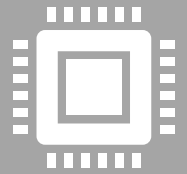
- We had observed that you cannot use the analog inputs for the function generator on the elvis without having errors. Once we switched to the digital inputs for the function generator our readings were as expected. We did also notice that the build is similar to a filter without the op-amp



Lab 14

Objective

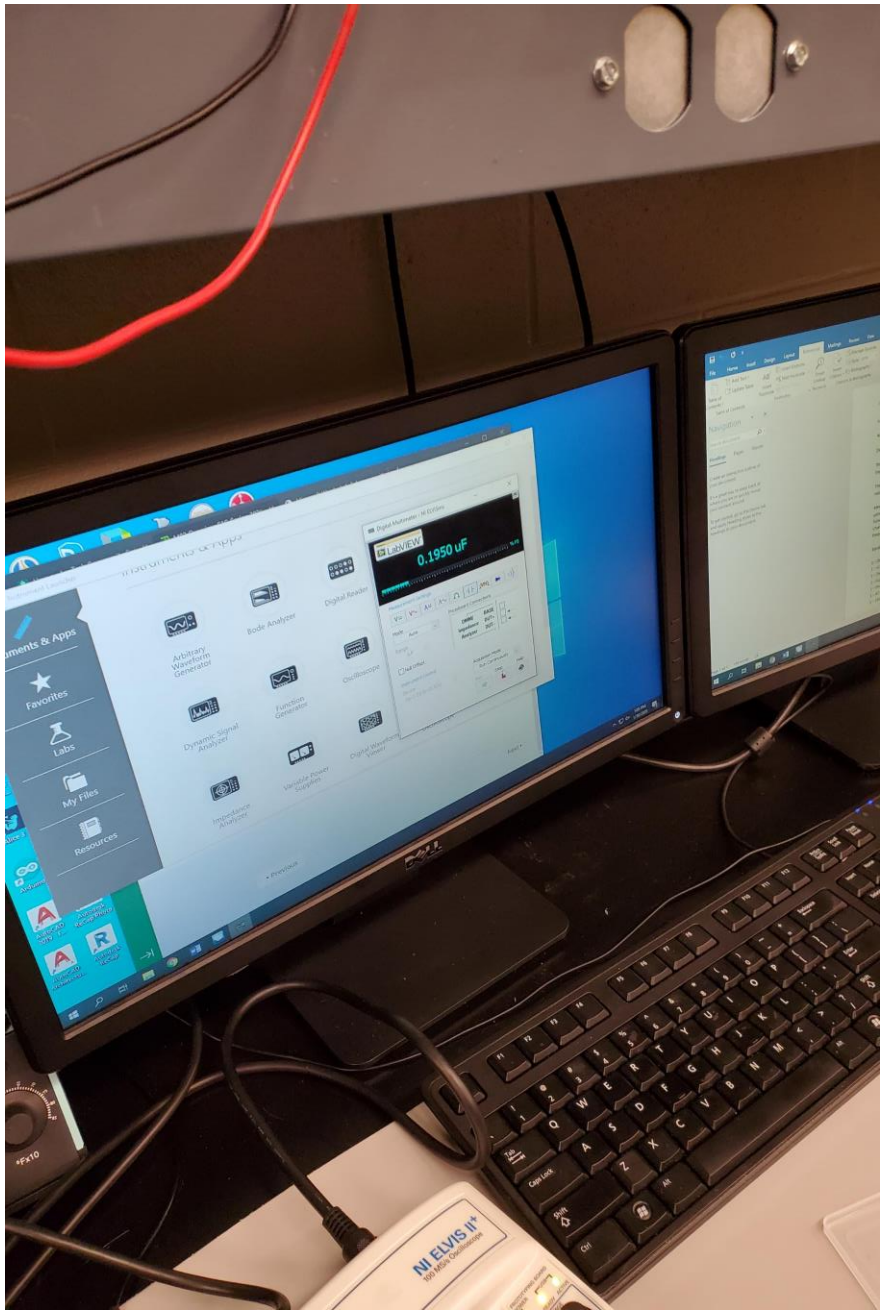
Experiment with RC (Resistor & Capacitor) circuits.

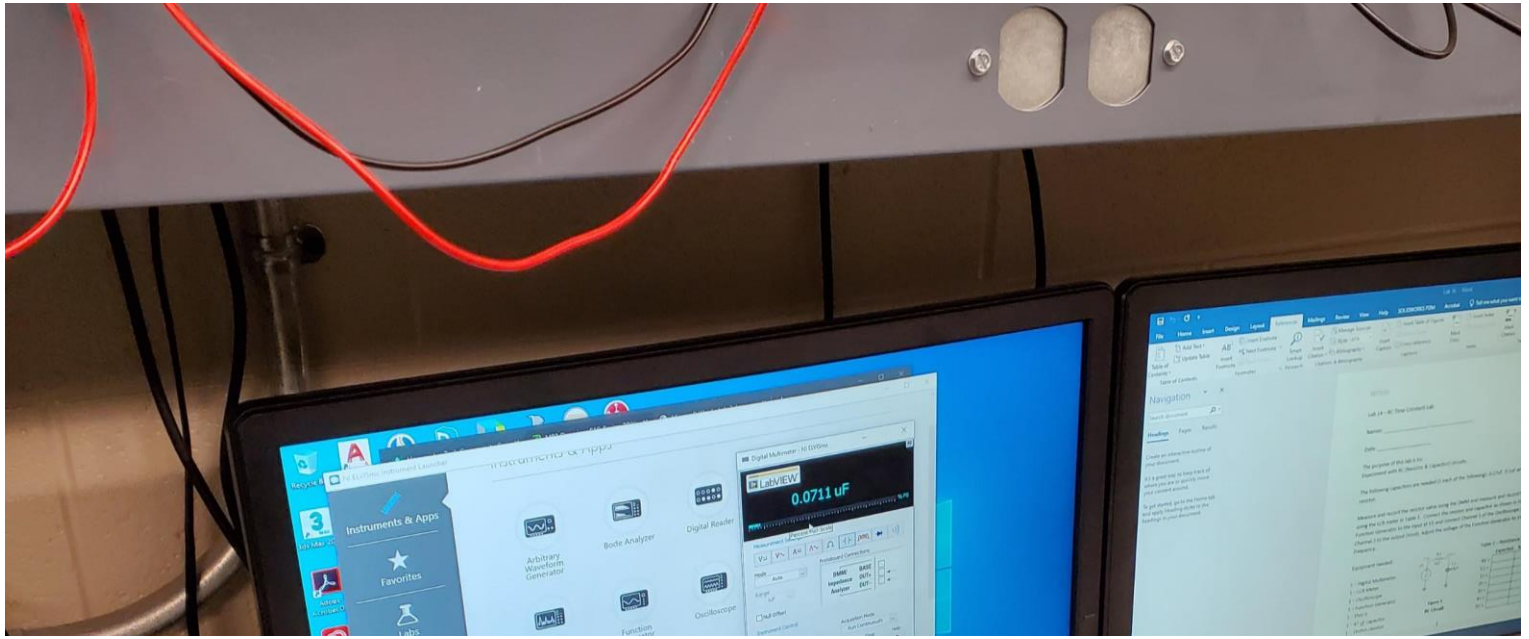


The following capacitors are needed (1 each of the following): 0.22uF, 0.1uF and 0.068uF and 1Kohm resistor.

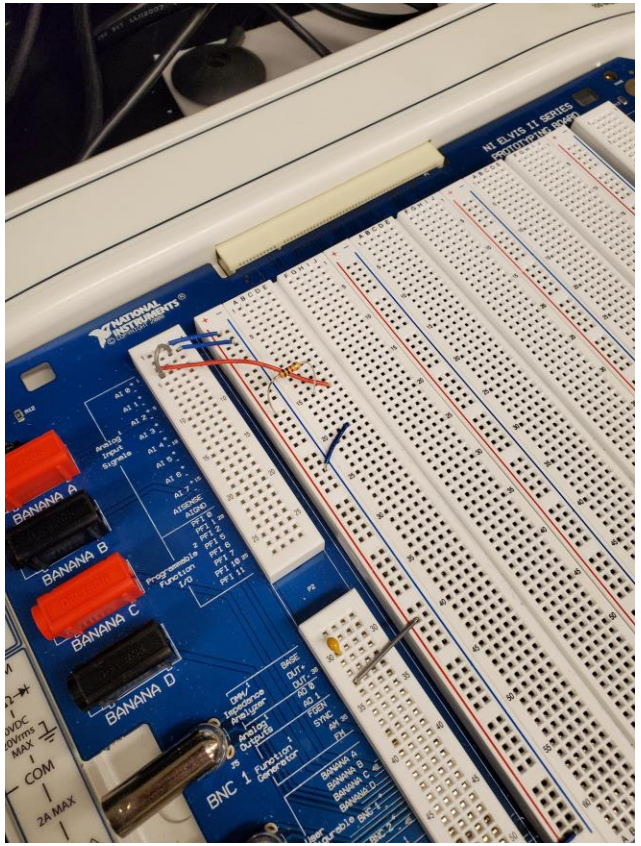
Equipment needed

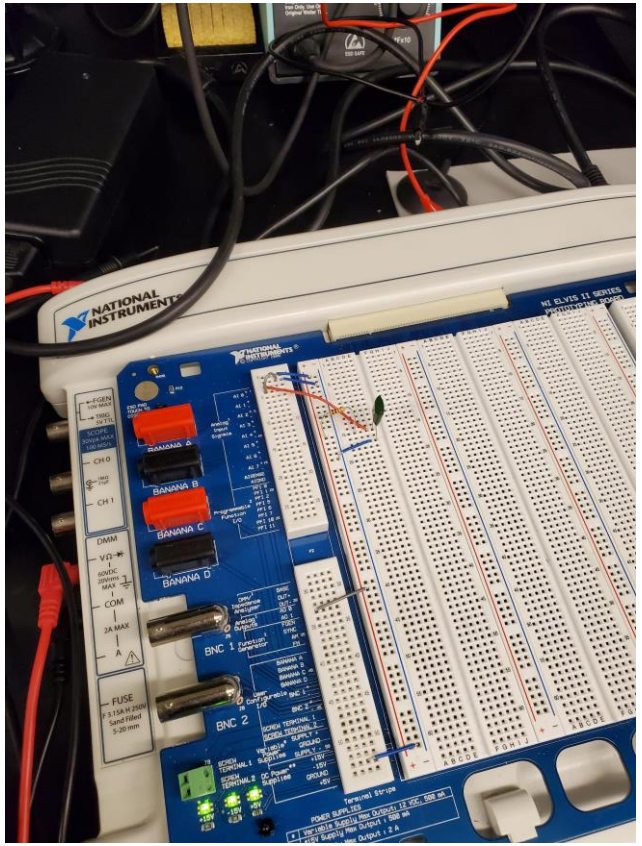
- 1 – Digital Multimeter
- 1 – LCR Meter
- 1 – Oscilloscope
- 1 – Function Generator
- 1 – Elvis II
- 1 – 0.22uF, 0.1uF and 0.068uF capacitor
- 1 – 1Kohm resistor

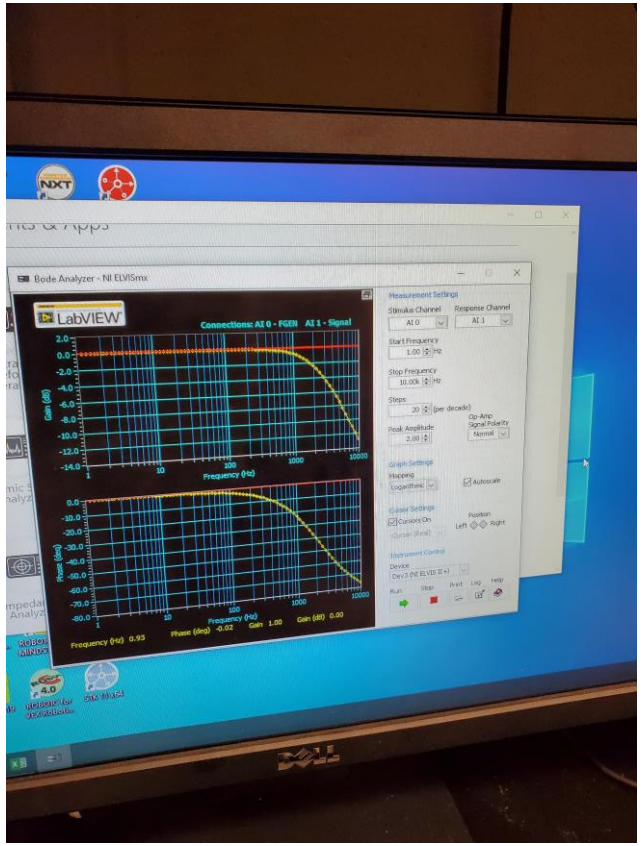




Lab 14 RC time constant


NI ELVIS II SERIES
BANANA A
BANANA B
BANANA C
BANANA D
BNC 1 Function Generator
COM
2A MAX


NATIONAL INSTRUMENTS
NI ELVIS II SERIES
BANANA A
BANANA B
BANANA C
BANANA D
BNC 1
BNC 2
FUSE


Bode Analyzer - NI ELVISmx
LabVIEW
Connections: AI 0 - FGEN AI 1 - Signal
Measurement Settings
Stimulus Channel
Response Channel
Start Frequency
Stop Frequency
Steps
Peak Amplitude
Op-Amp Signal Polarity
Graph Settings
Mapping
Autoscale
Cursor Settings
Cursors On
Instrument Control
Device
Run
Stop
Print
Log
Help
Frequency (Hz)
Gain (dB)
Phase (deg)

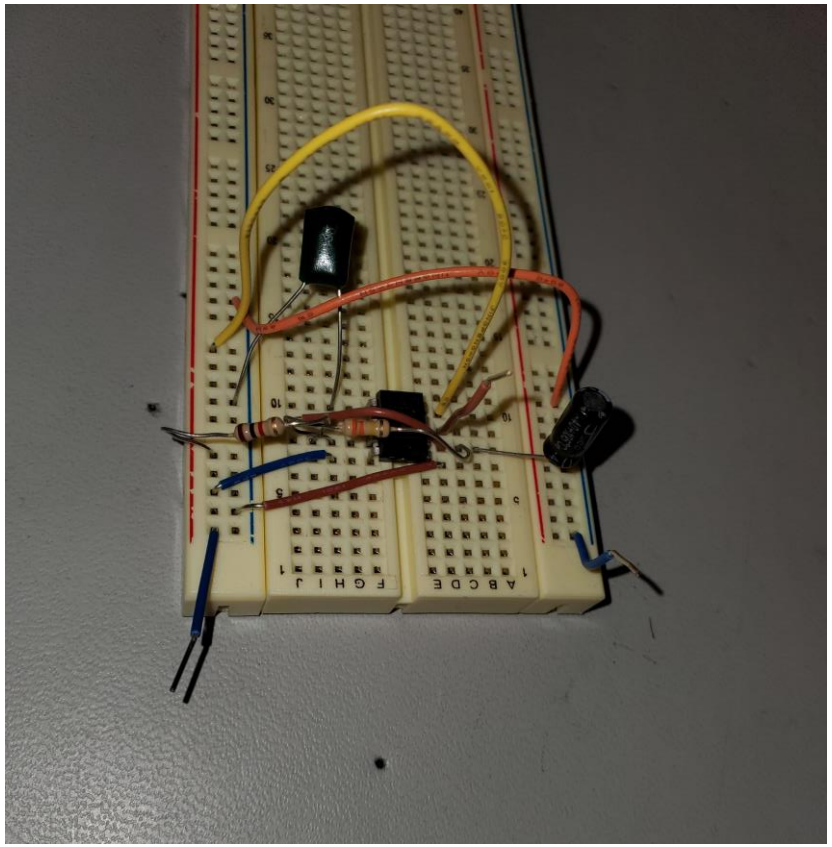
Lab 14

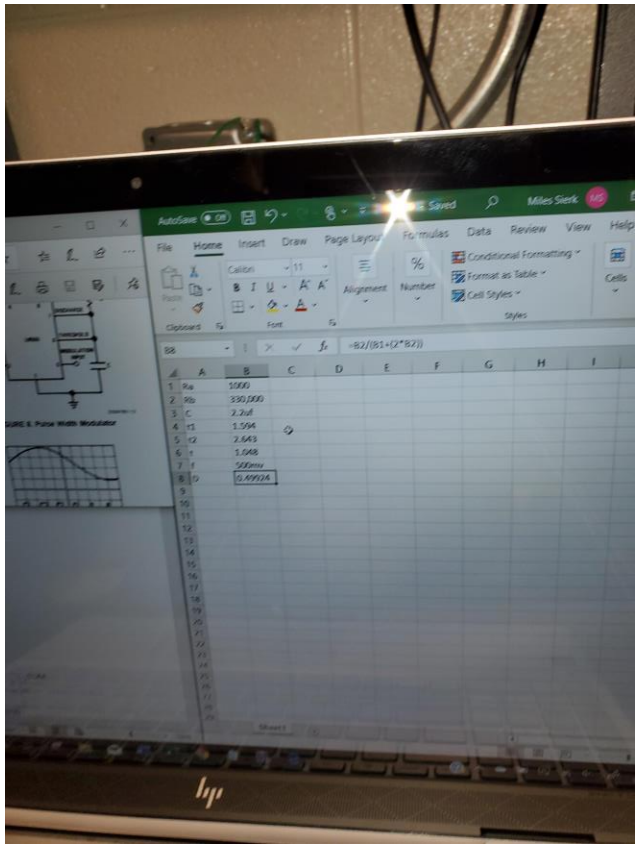
Observations

- Everything was fairly straight forward we decided to try and hook the capacitor for one of the builds directly to the DMM and it worked out fairly well also.

Filter Design Lab 1-4

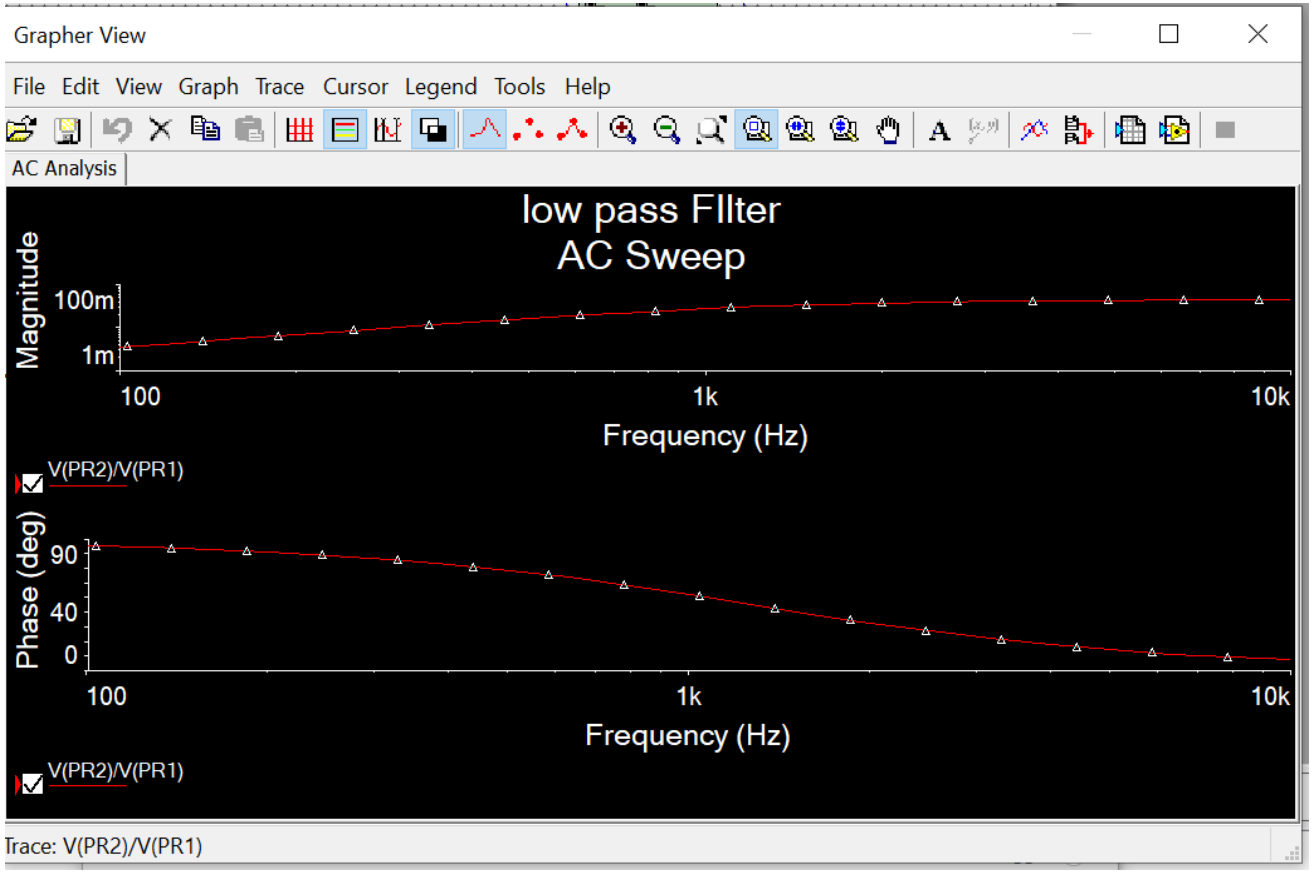
- Lab 1 - Design, Build and Test a Butterworth Low-Pass filter with a 3dB point @ 1KHz.
- Lab 2 - Design, Build and Test a Butterworth High-Pass filter with a 3dB point @ 1KHz.
- Lab 3 - Design, Build and Test a Band-Pass filter with a 3dB point @ 1KHz
- Lab 4 - Design, Build and Test a 1KHz Notch filter.

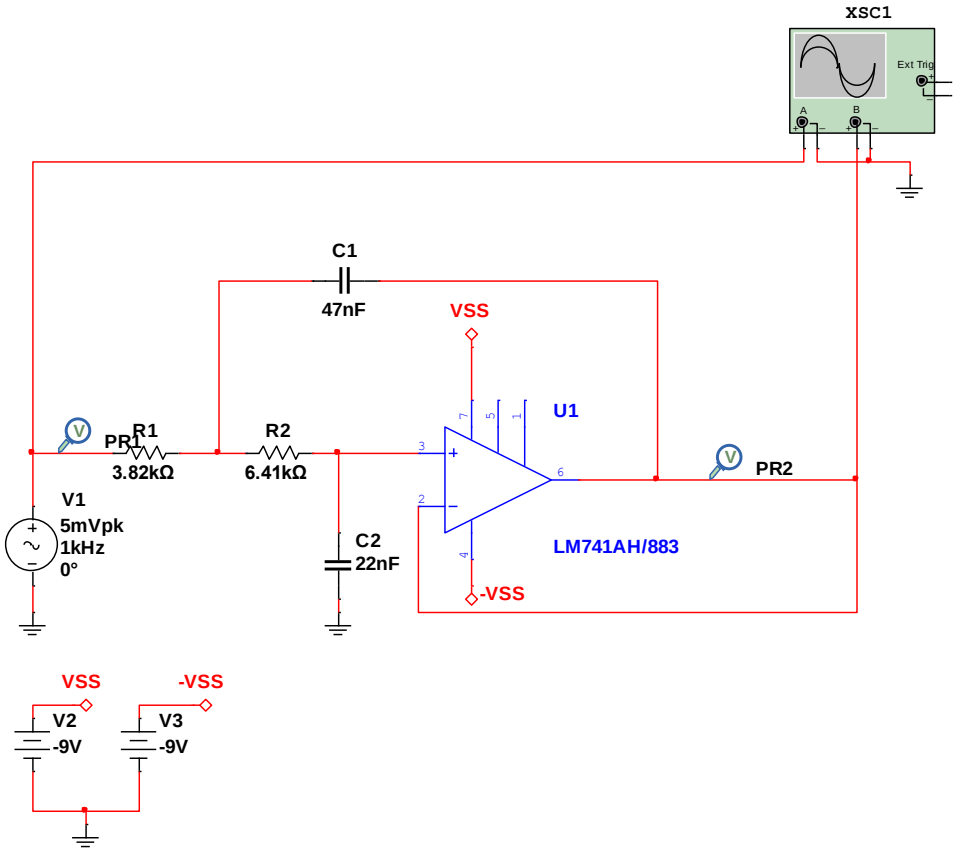




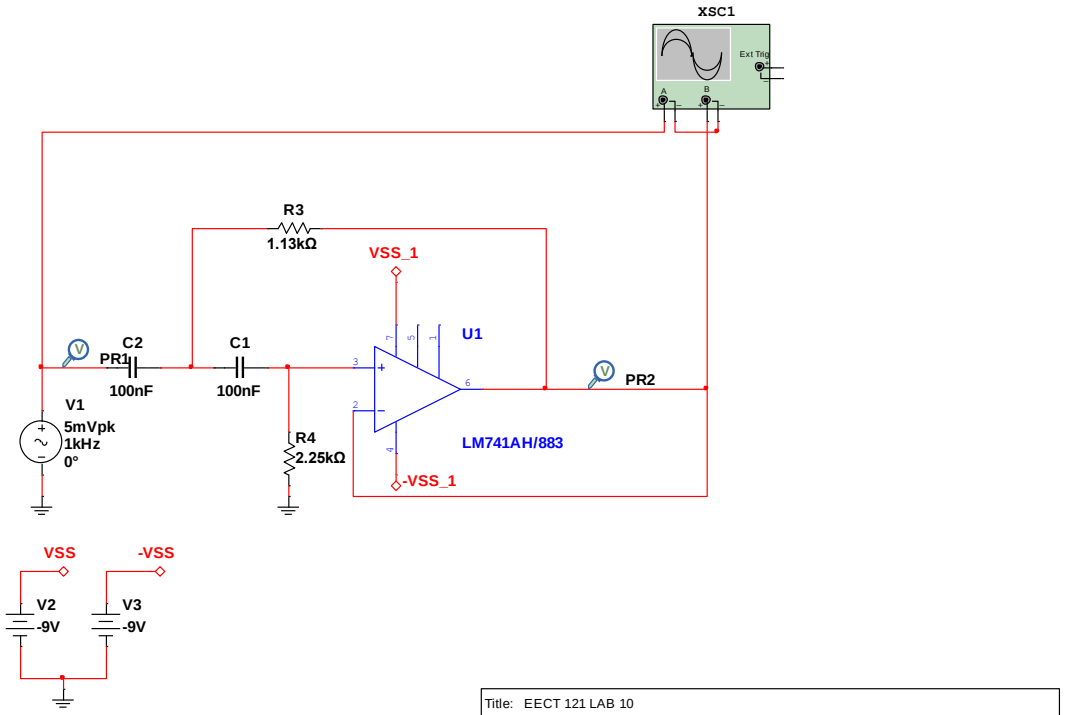
Lab 1 - Design, Build and Test a Butterworth Low-Pass filter with a 3dB point @ 1KHz.

Lab 1 - Design, Build and Test a Butterworth Low-Pass filter with a 3dB point @ 1KHz.

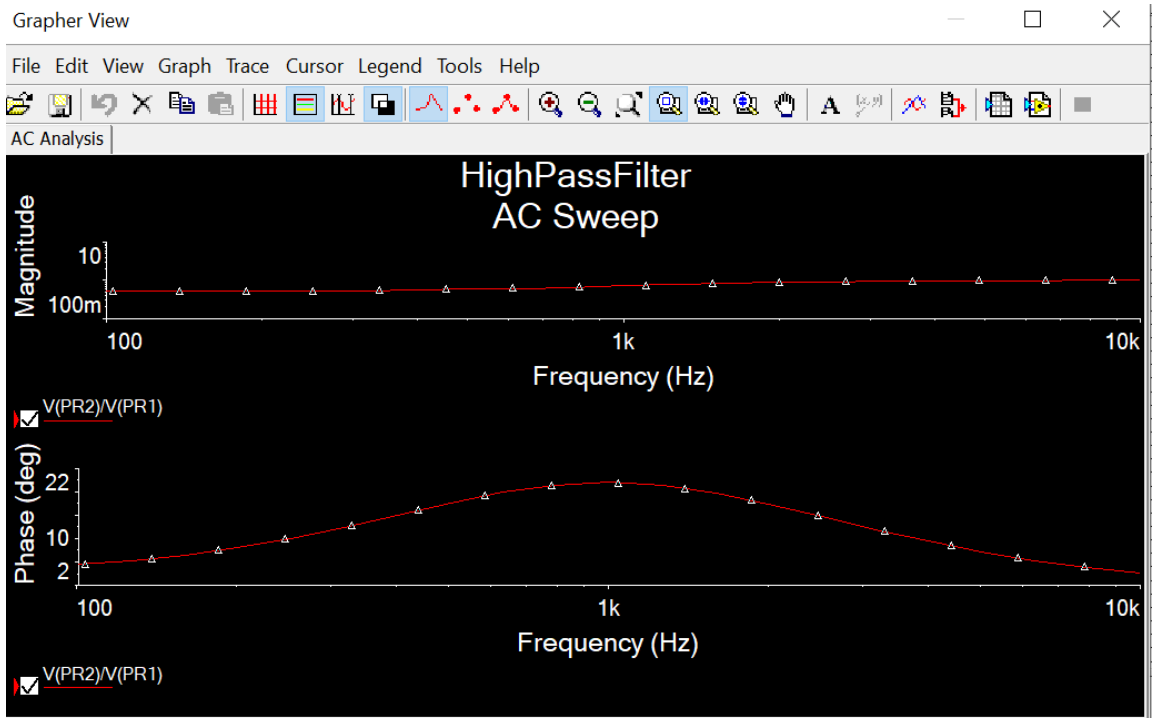




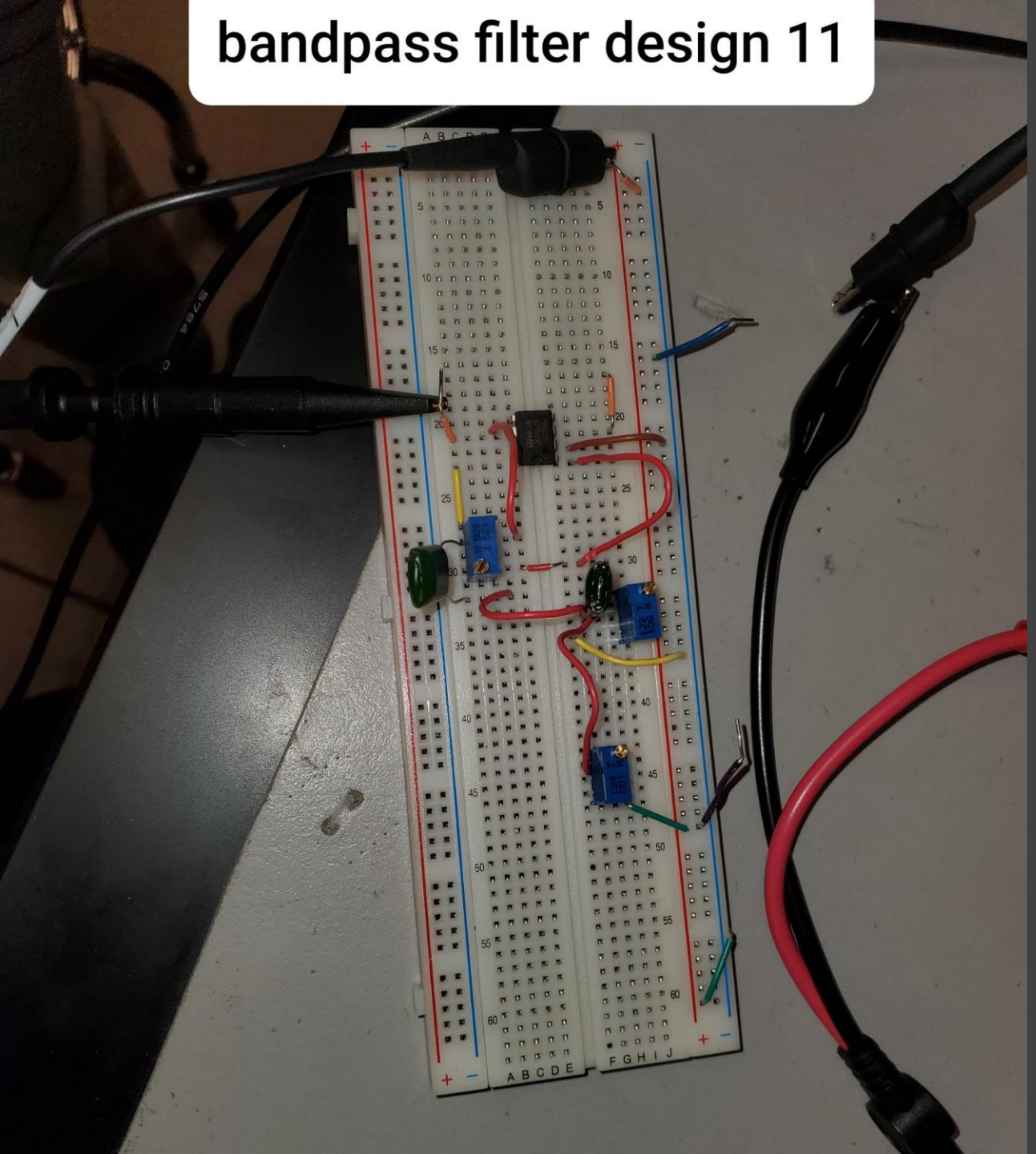
Lab 2 - Design, Build and Test a Butterworth High-Pass filter with a 3dB point @ 1KHz.



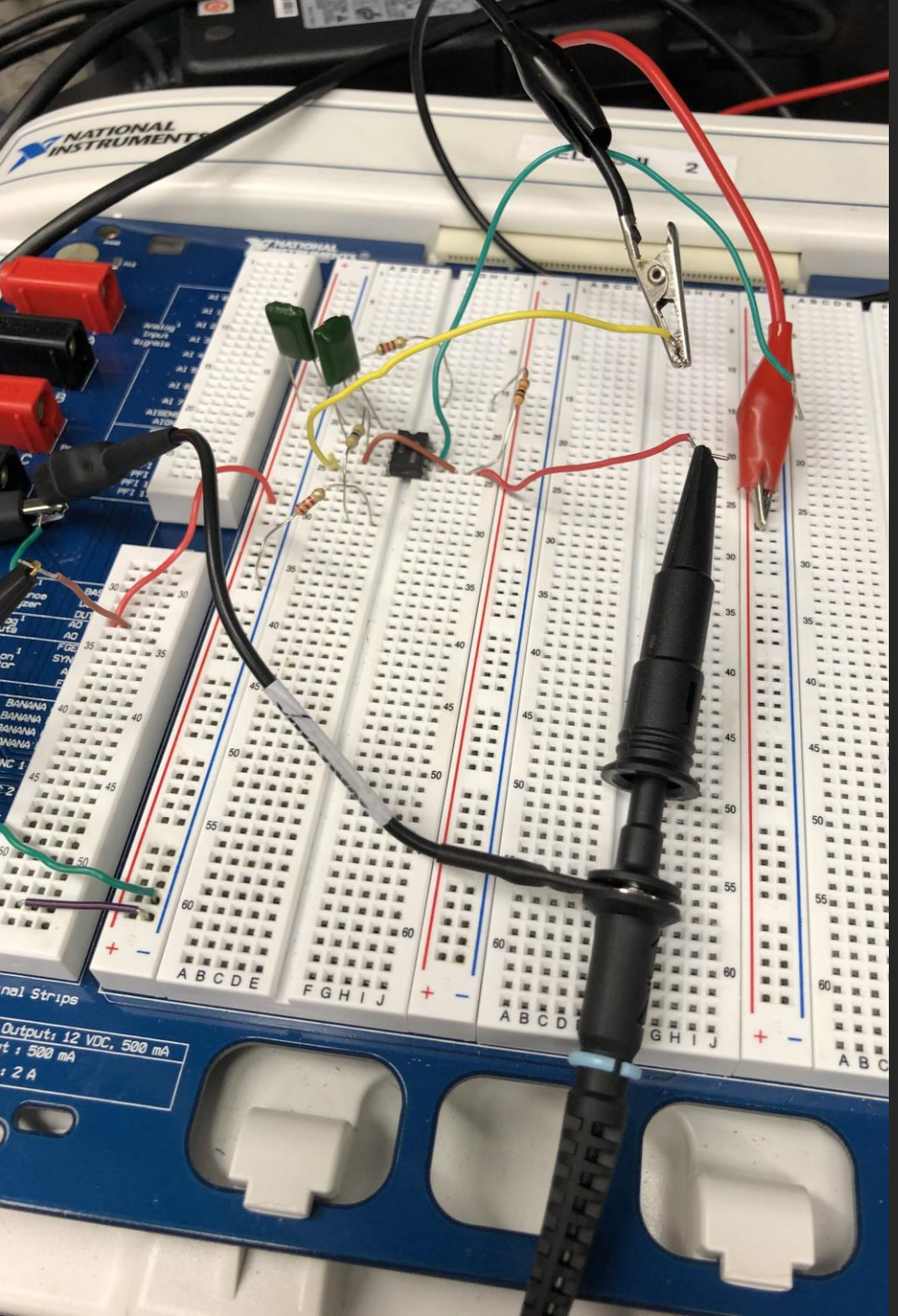
Title: EECT 121 LAB 10		
HighPassFilter		
Designed by:	Document N:	Revision:
Checked by:	Date: 05/16/20	Size: A
Approved by:	Sheet 1 of 1	



Lab 2 High pass filter



Lab 3 - Design, Build and Test a Band-Pass filter with a 3dB point @ 1KHz.



Lab 4 - Design, Build and Test a 1KHz Notch filter.

Filter observations

After simulating and building these filters, we noticed that the numbers recorded from simulation and from builds were acceptable. We did notice that the filters are fairly similar in build to what we have been doing all semester with RC & RL circuits other than the OP-AMP chip

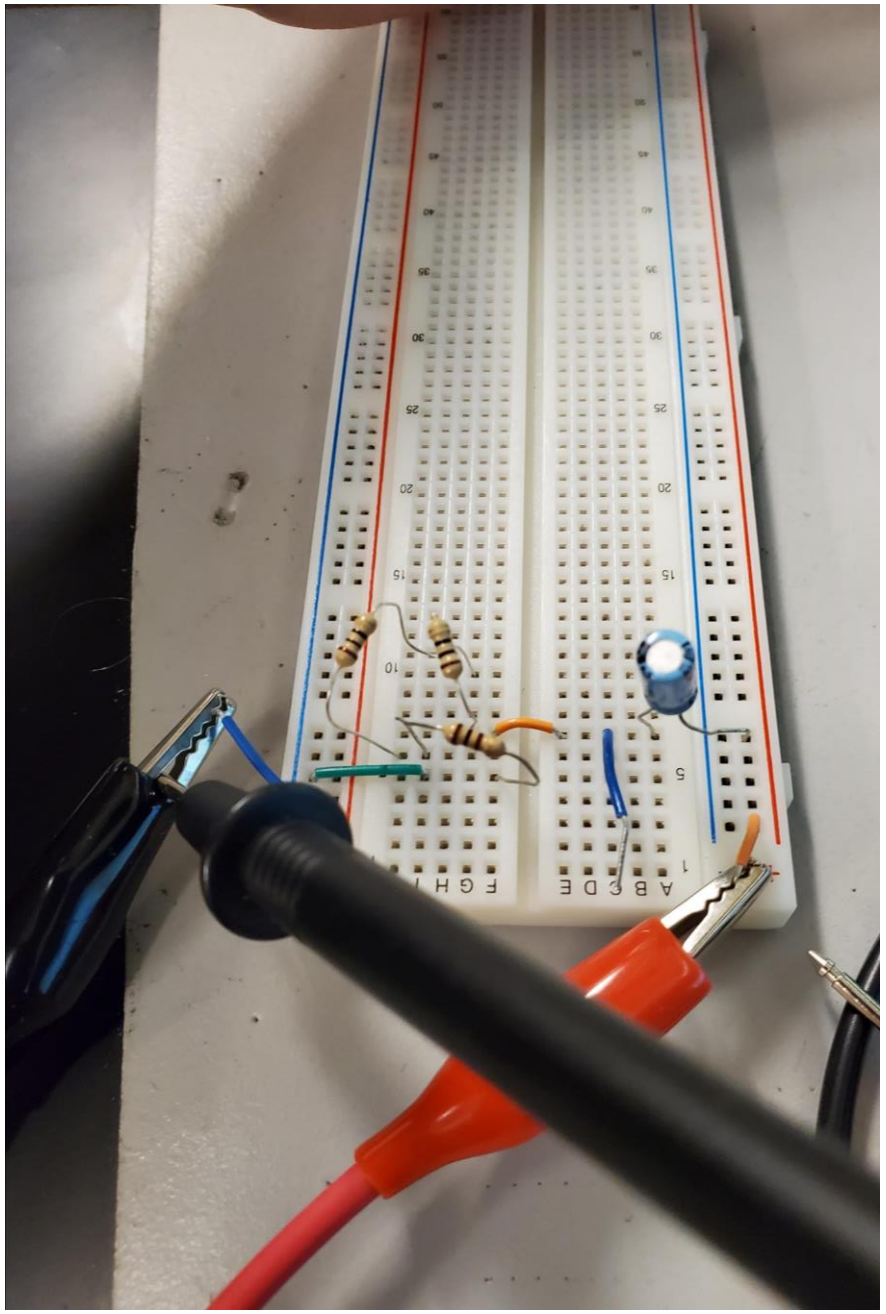
Lecture 19 Lab

- Design, build and test a RC circuit that divides the input voltage in half. The input voltage is 1Vpp @ 1KHz.

Lecture 19 slide 14

F=	100		F=	10.00	
C=	1.000E-6		C=	1.0E-6	
R=	3.975E+3		R=	4.0E+3	
Xc=	1.592E+3		Xc=	15.9E+3	
Z=	4.282E+3		Z=	16.4E+3	
θ	21.82066		θ	75.98	
VT=	200	200	VT=	200.00	
IT=	46.710E-3			IT=	12.2E-3
VC=	74.340522			VC=	194.04
VR	185.67037			VR	48.46

t =	10.000E-3			t =	0.10
degrees=	360		degrees=	360.00	
deg/s =	36.000E+3			deg/s =	3600.00
dT =	264.093E-6			dT =	0.00
phase shift =		9.507E+0	phase shift =		0.95




M747
LM2905
OP77
C 1036.8nF
D .0392
F:1.0000 kHz
V:1.000 V
AUTO MANU
R.H OFF
C.V OFF
INT.B OFF
SPEED
FAST
DISPLAY
VALUE
MODE
C/D
CIRCUIT
SERIES
MENU

Lecture 19

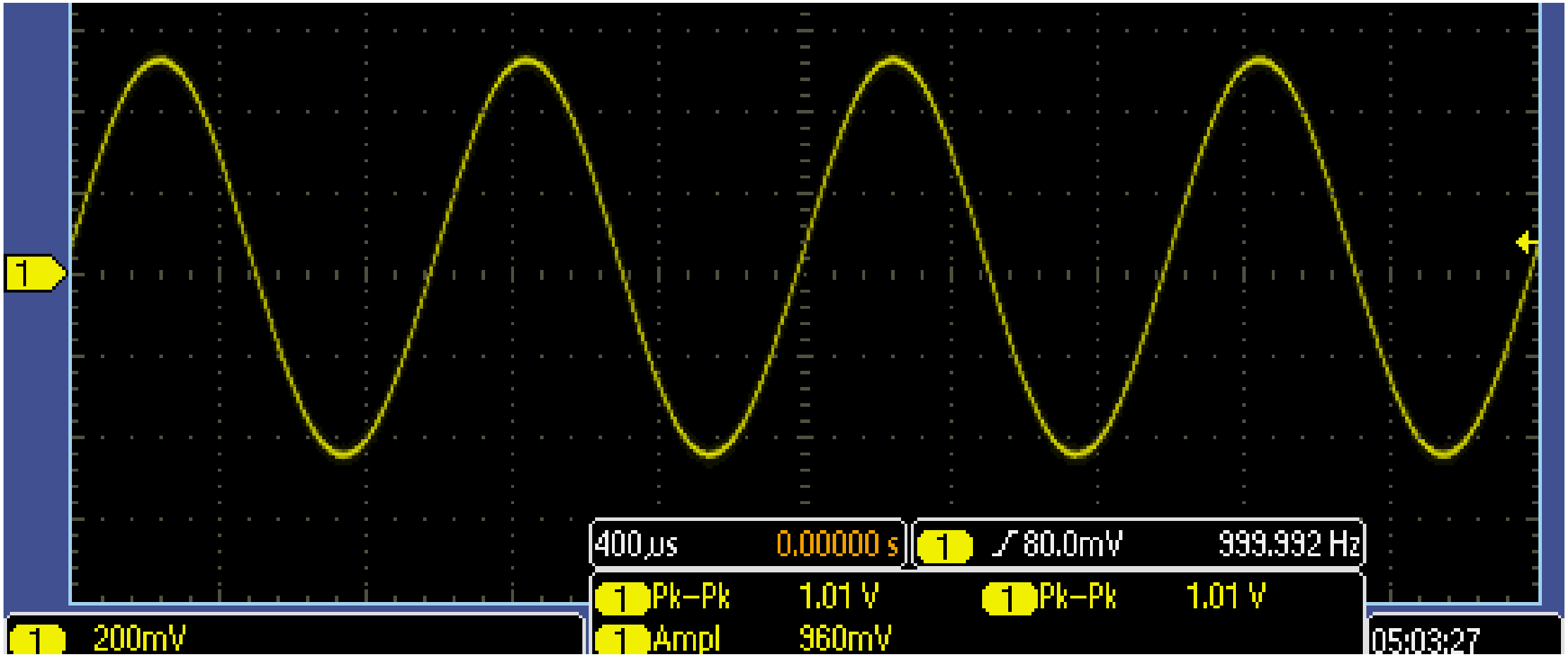
Observations

- After connecting the function generator and the oscilloscope, we adjusted the amperage using the function generator to get the peak to peak voltage to 1volt generating a sin wave
- We got the multi sim to properly output half voltage output with 1vp-p and 1Khz Frequency but with the physical build be got about 65-70% input voltage as our output.

Lab 15 Rl time constant

- Design, build and test a a series RL circuit with
- L = 4.7mH
- F = 10KHz,
- Vin =1Vpp
- Determine the R values that produces
- Vout = 0.707 Vpp
- Vout =0.5 Vpp

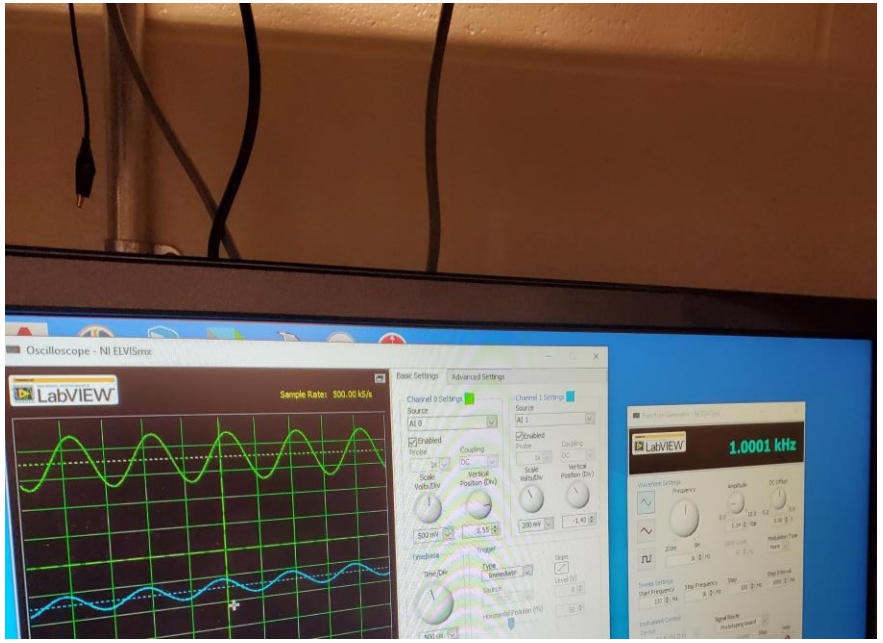
Lab 15

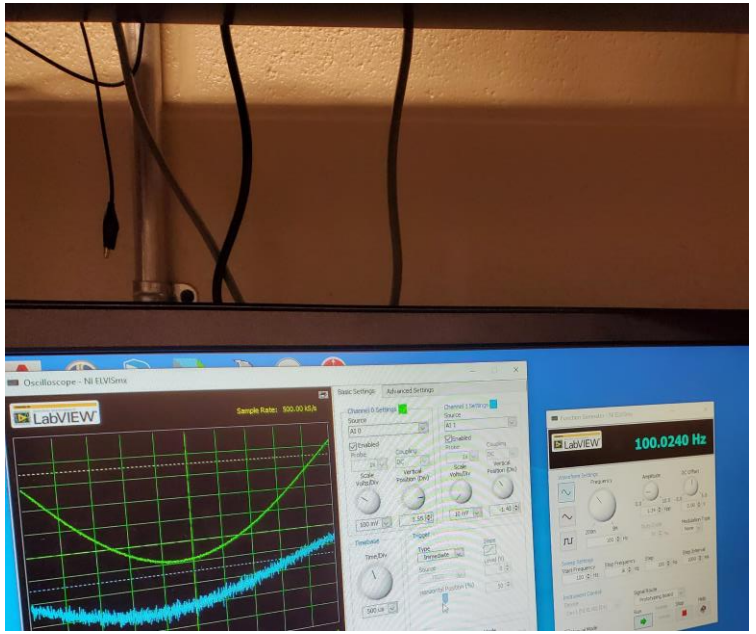

1
400 µs
0.00000 s
1
80.0mV
999.992 Hz
1 Pk-Pk 1.01 V
1 Pk-Pk 1.01 V
1 Ampl 960mV
1 200mV
05:03:27

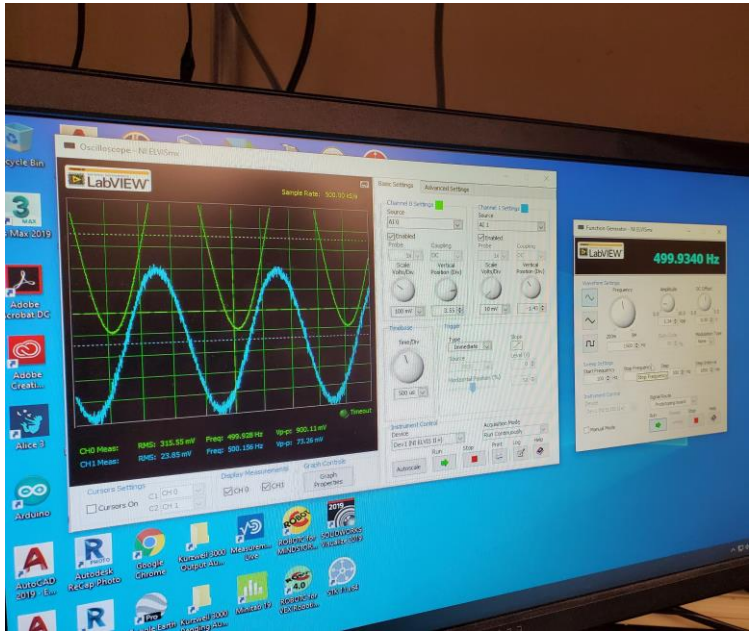
Lab 15 RL time constant

F=	1.0E+3		F=	10.0E+3
L=	10.0E-3		L=	10.0E-3
R=	100.0E+0		R=	100.0E+0
XL	62.8E+0		XL	628.3E+0
Z=	118.1009812		Z=	636.2265132
θ=	32.14190764		θ=	80.95693892
Vt	200	200	Vt	200
I(total)	1.693466032		I(total)	0.314353451
Vr	169.3E+0		Vr	31.4E+0
Vl	106.4E+0		Vl	197.5E+0

t =	1.0E-3
degrees=	360
deg/s =	360.0E+3
dT=	9.87E-06
phase shift =	3.55E+00


Oscilloscope - NI ELVISmx
LabVIEW
Sample Rate: 500.00 kS/s
1.0001 kHz


Oscilloscope - NI ELVISmx
LabVIEW
100.0240 Hz

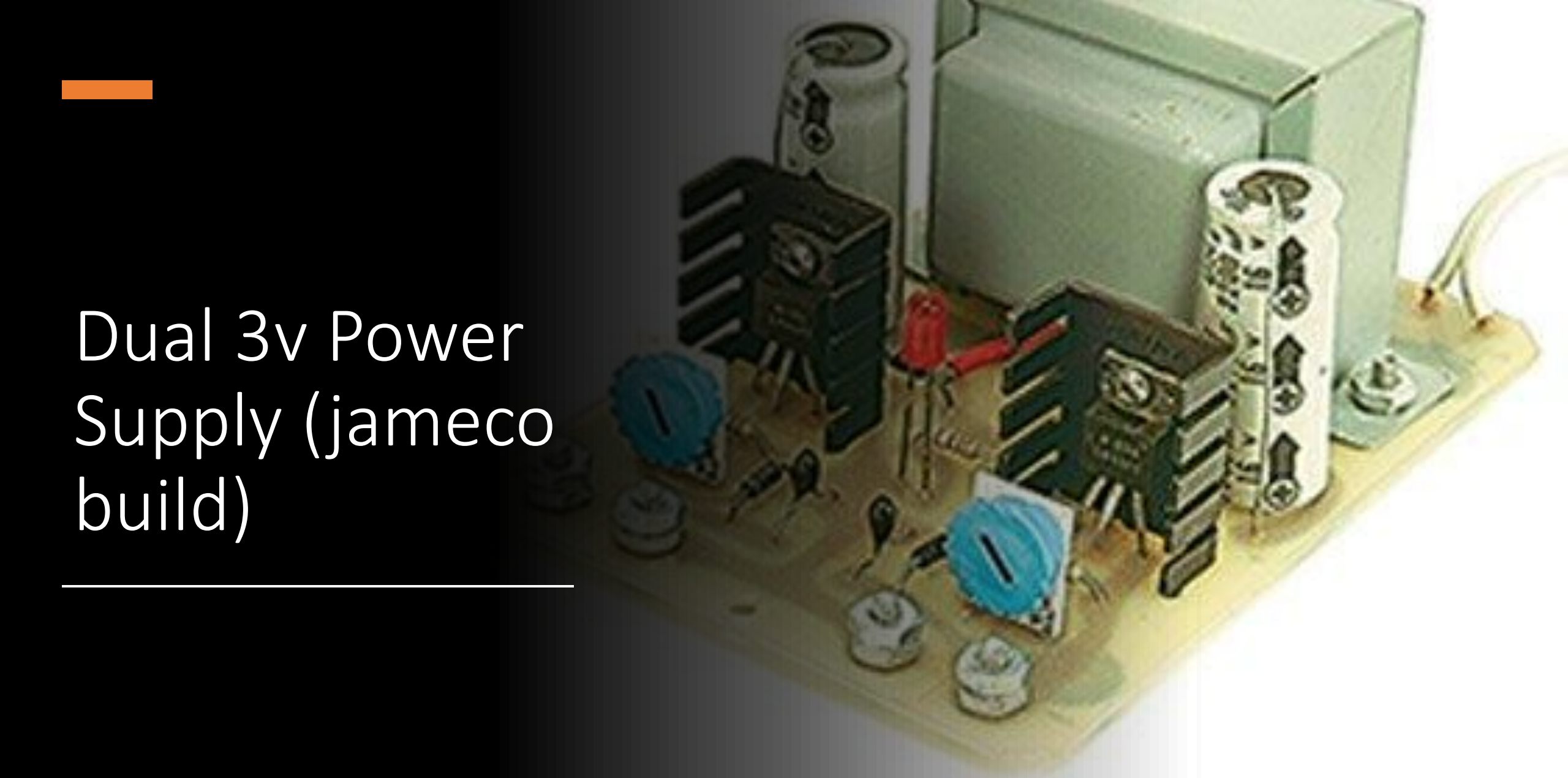

LabVIEW
499.9340 Hz

Lab 15

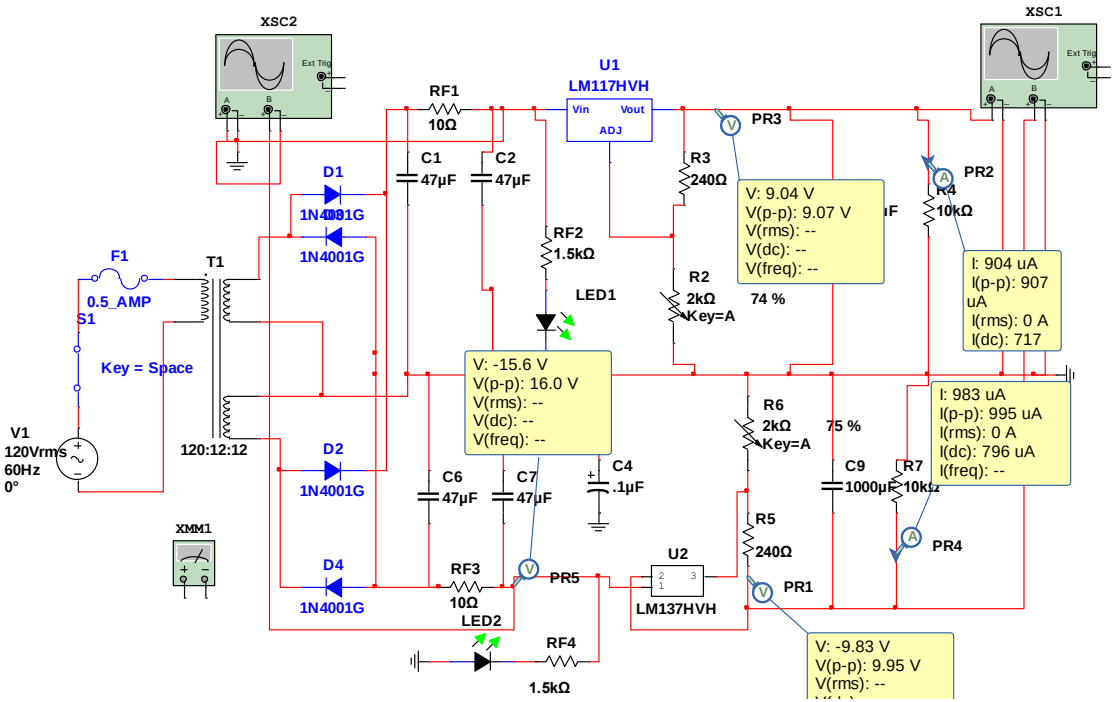
Observations

- We had a an inductor that was defective that we didn’t catch until we tried to get reading. Then we went back and tested them to swap out the 4.7mH inductor that was bad.

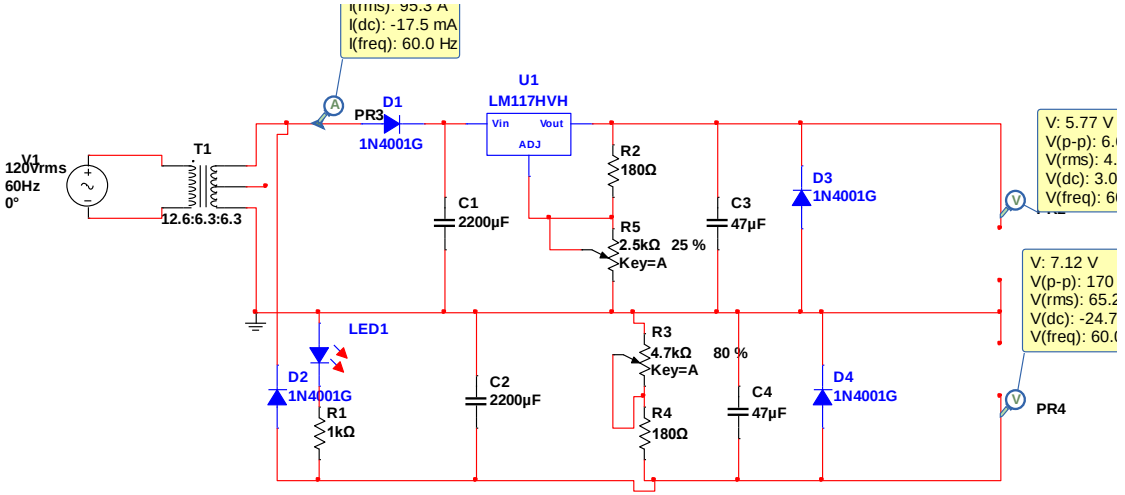
Dual 3v Power Supply (jameco build)



Our build



Jameco build

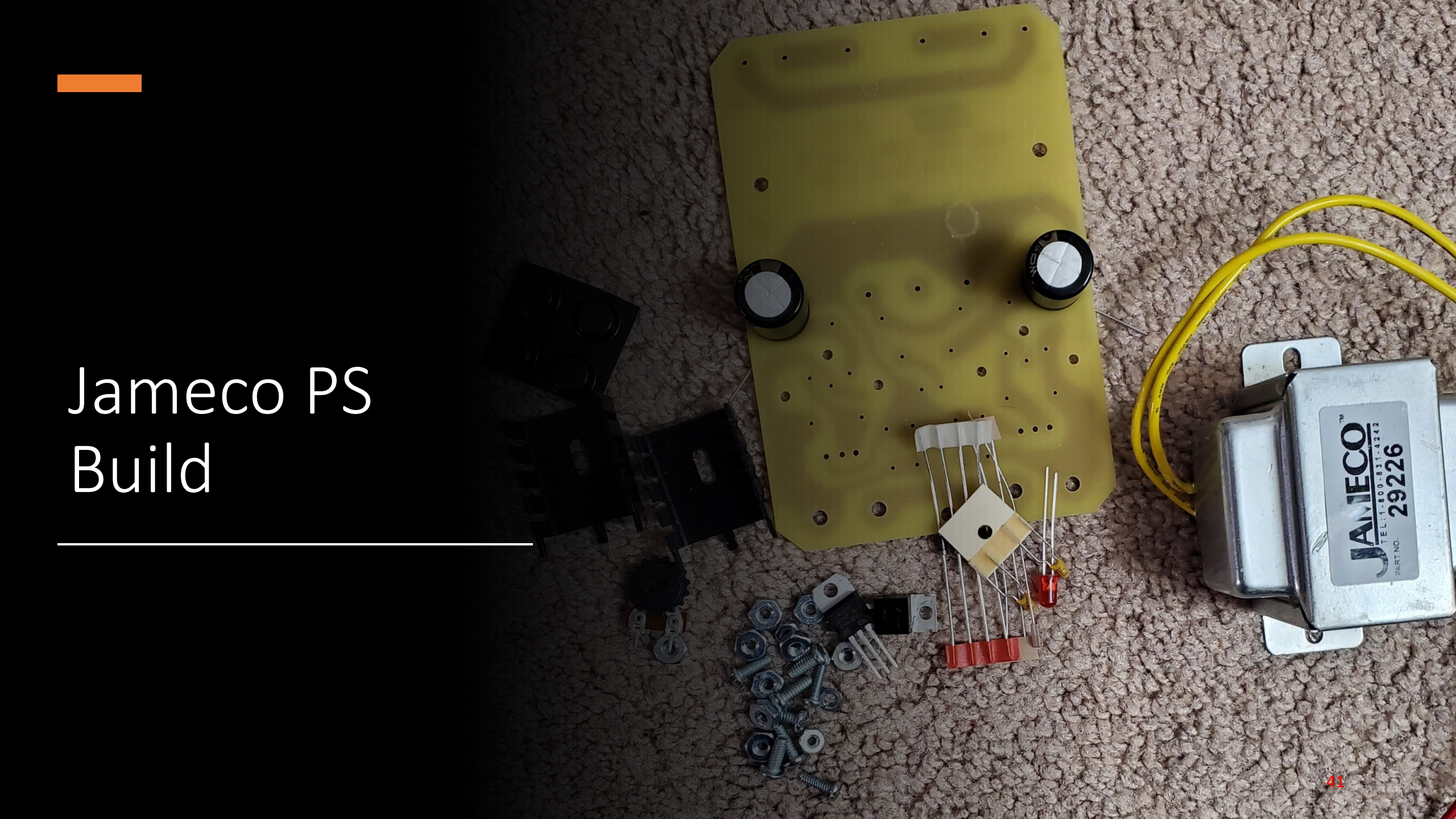


3v power supply

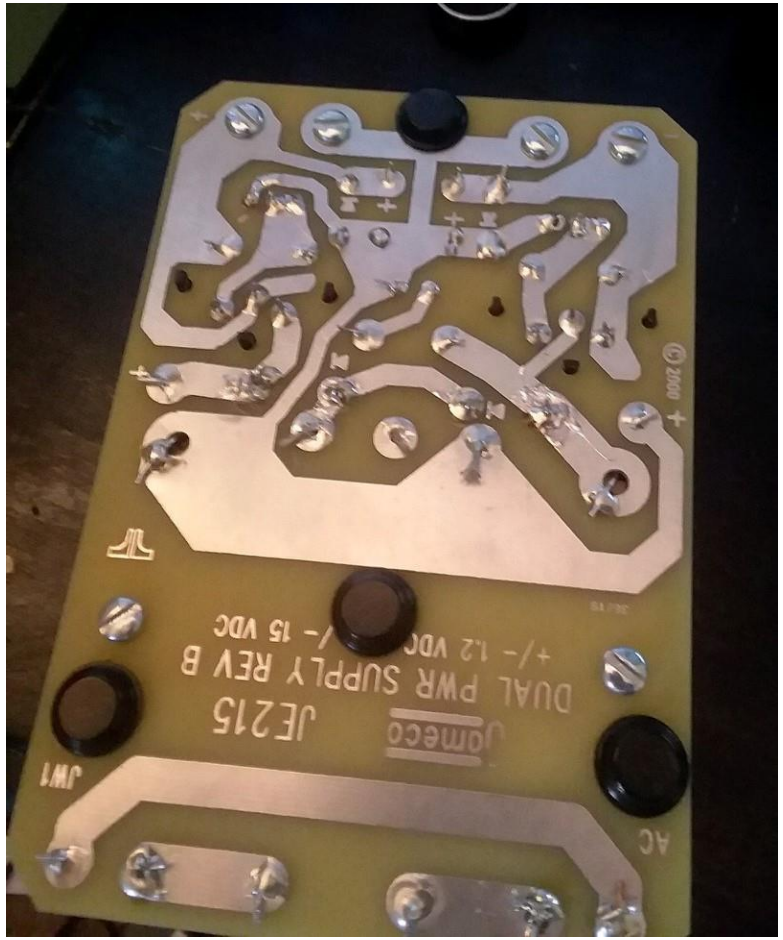
Observations

- First thing we notice was that it used a different type of transformer, and it didn’t have a pi filter.
- The power supply orientation is also different
- After building the simulation we notice the single led was blinking due to still being in the AC phase., and
- that we used variable resistors in our build and the jameco uses potentiometer. The jameco also has a central ground and has taps for ground while, our supply last semester did not have ground taps.
- Also the jameco design has heat sinks while we did not. Our design had almost double the parts compared to the jameco design.
- The jameco is more cost effective compared to our design from last year.

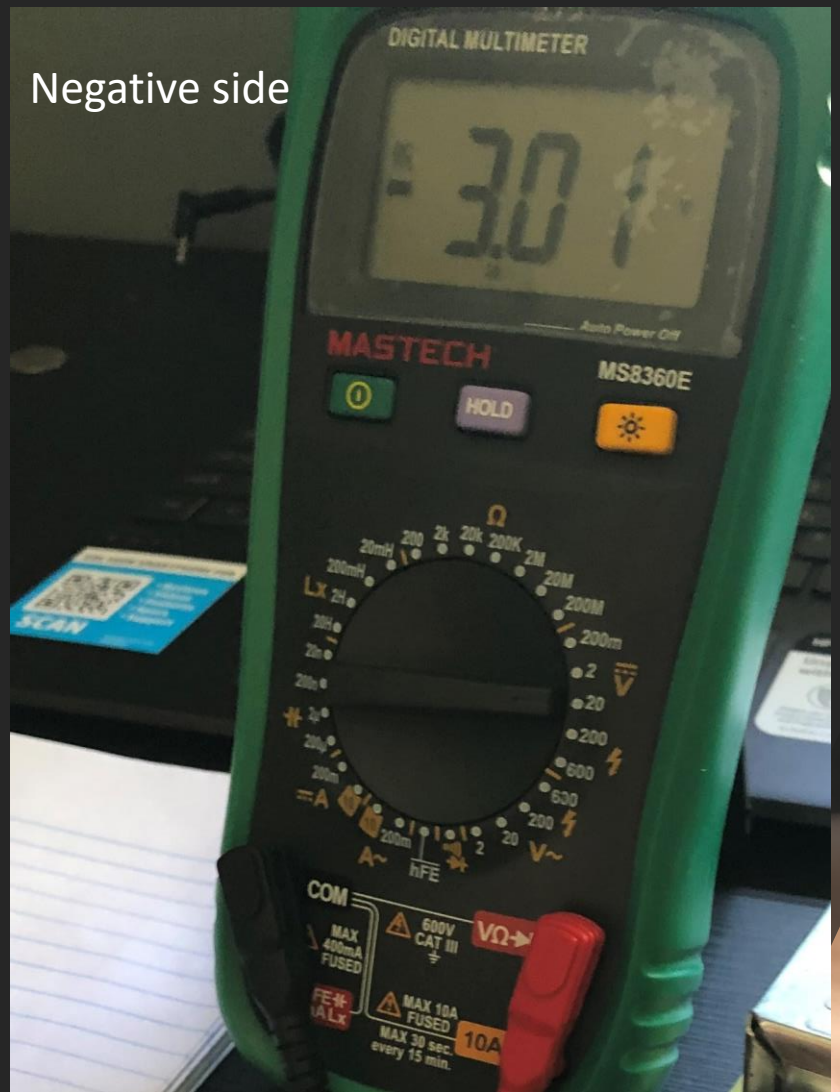
Jameco PS Build



Jameco PS



Physical jameco powersupply build



Observations

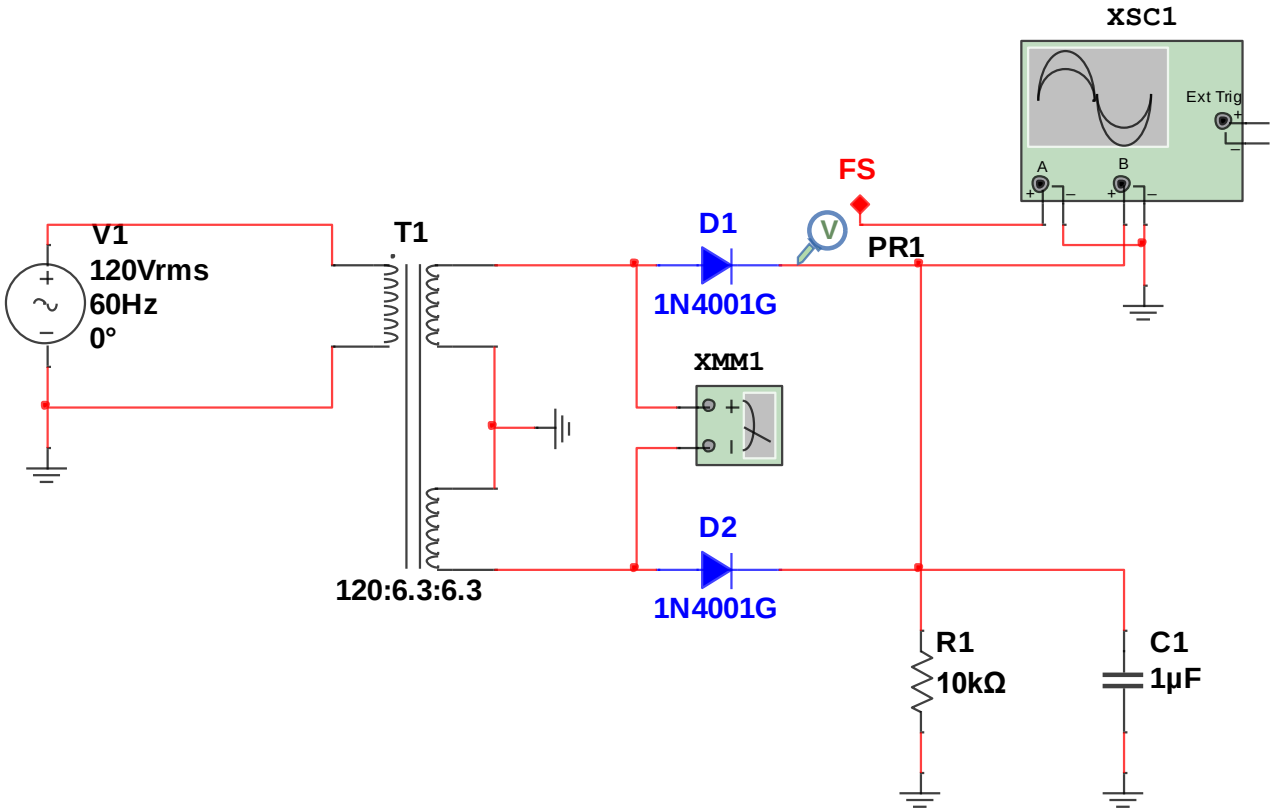
- Initially the power supply build was straight forward. And with the potentiometers I was surprised at the range of voltage I was able to achieve and ended up blowing my led being careless and leaving it on while I went to the restroom.

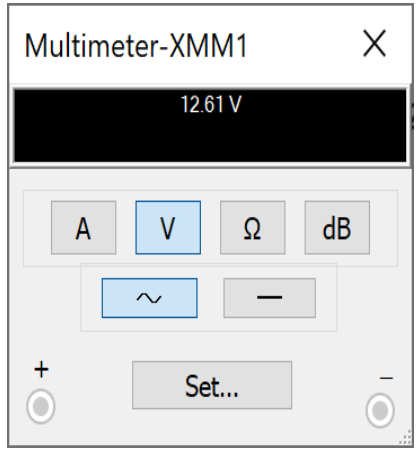
Fourier series

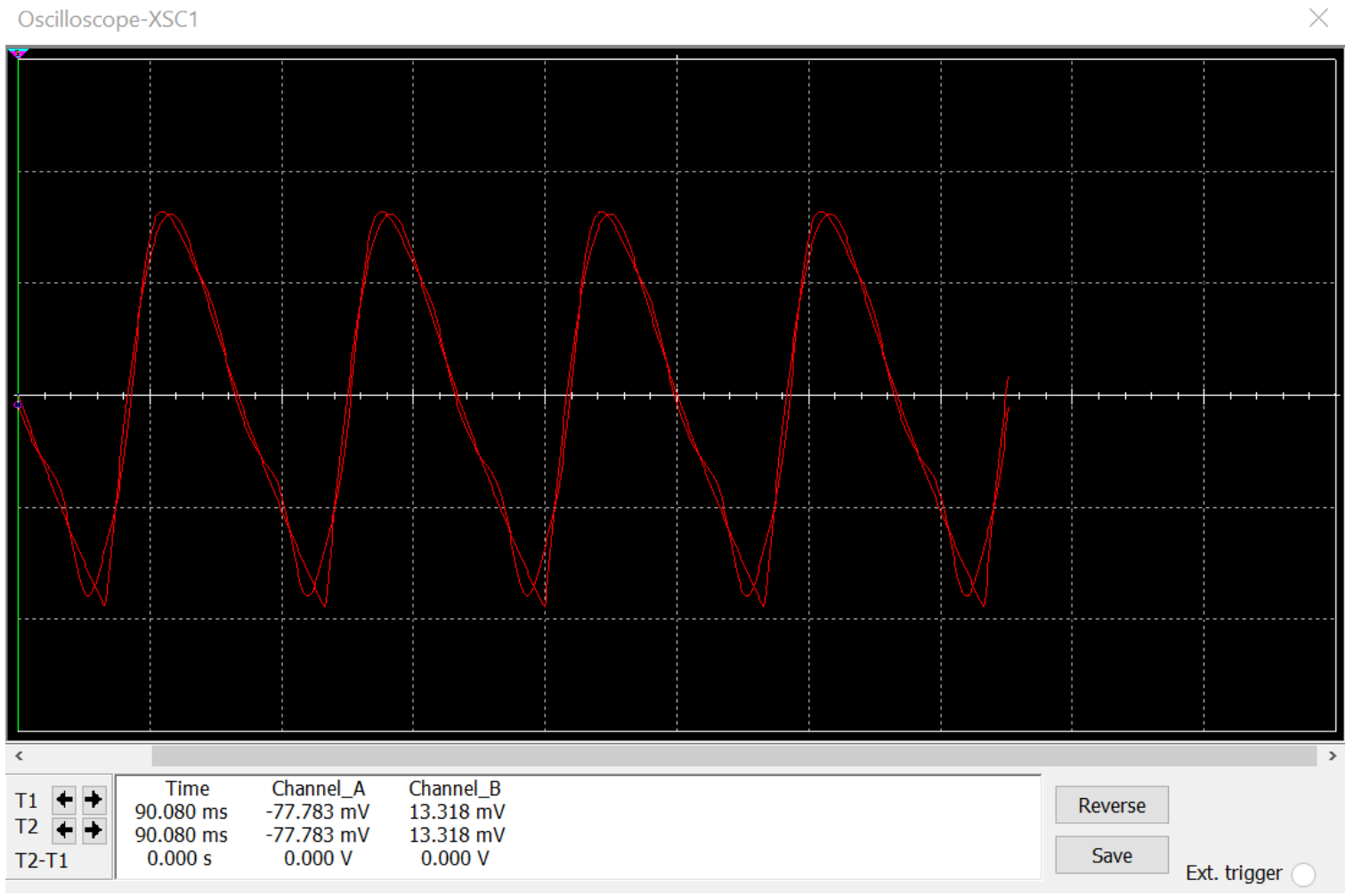
- Objective

- Watch the video and rebuild the simulation for the fourier series

Fourier series

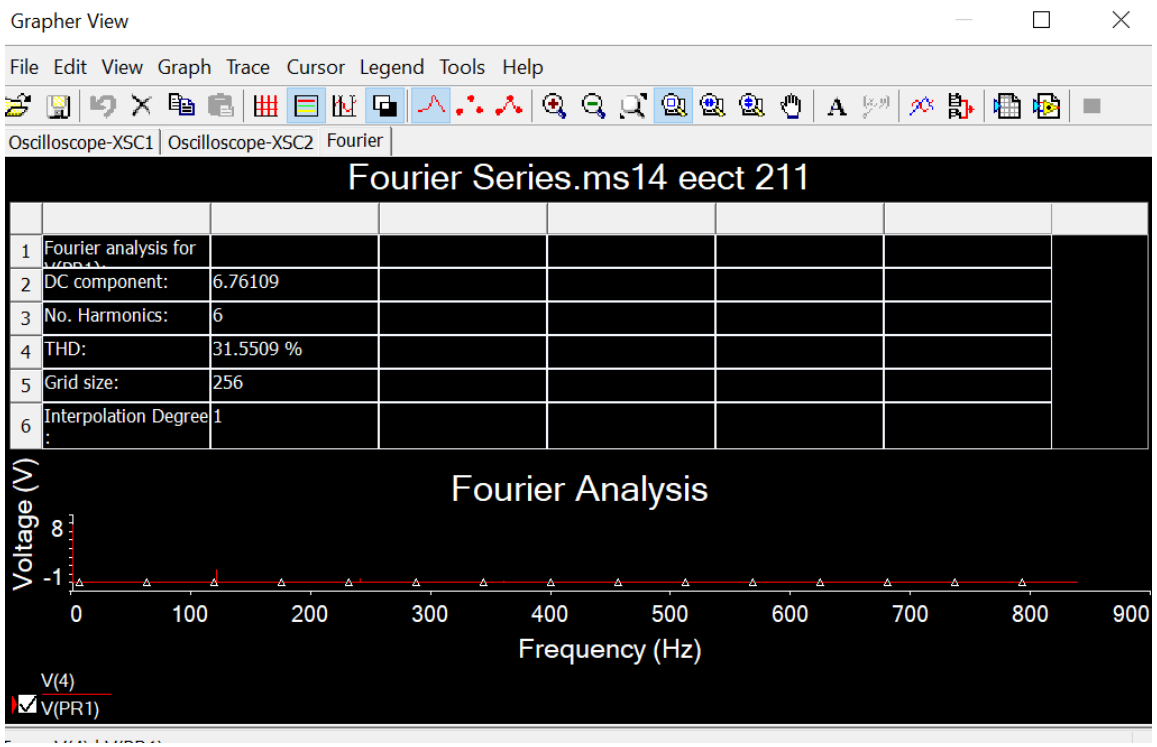


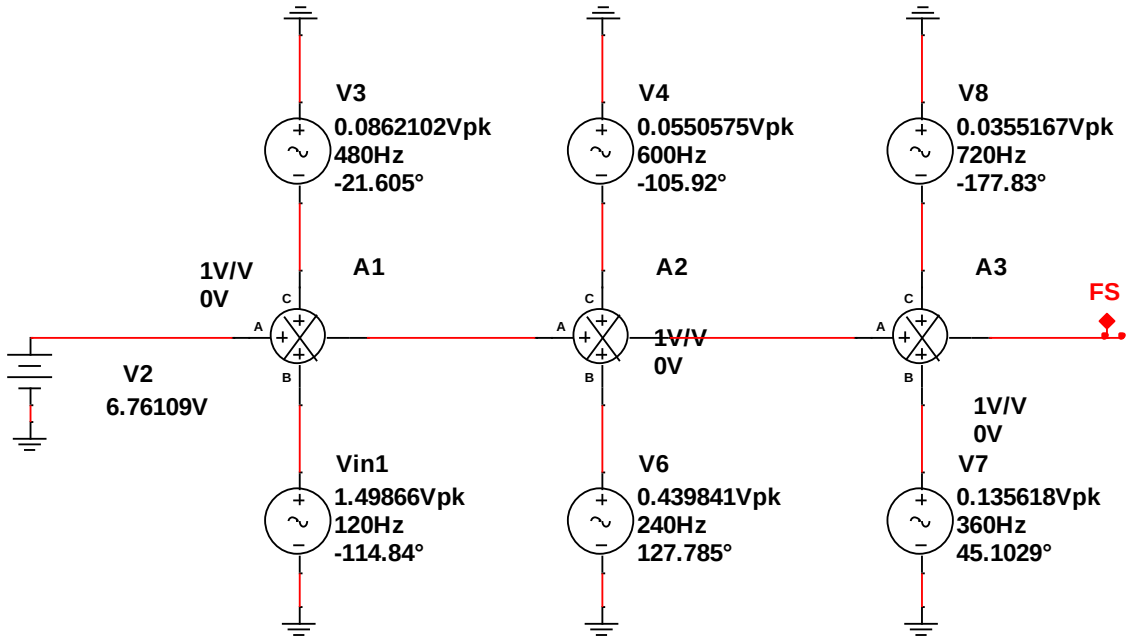


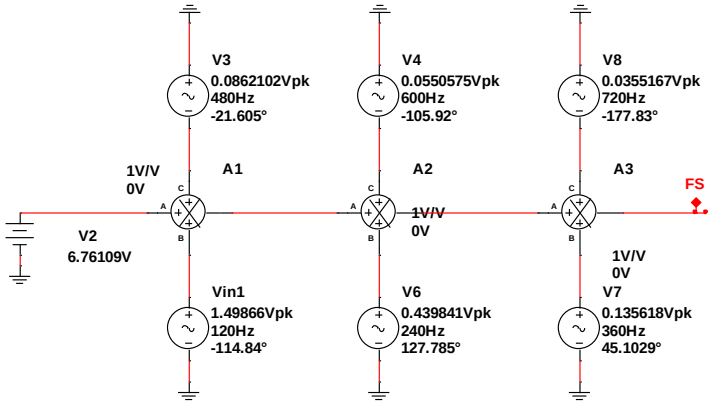


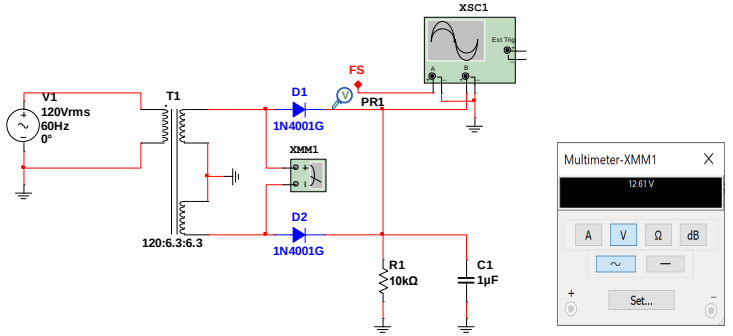
Fourier series

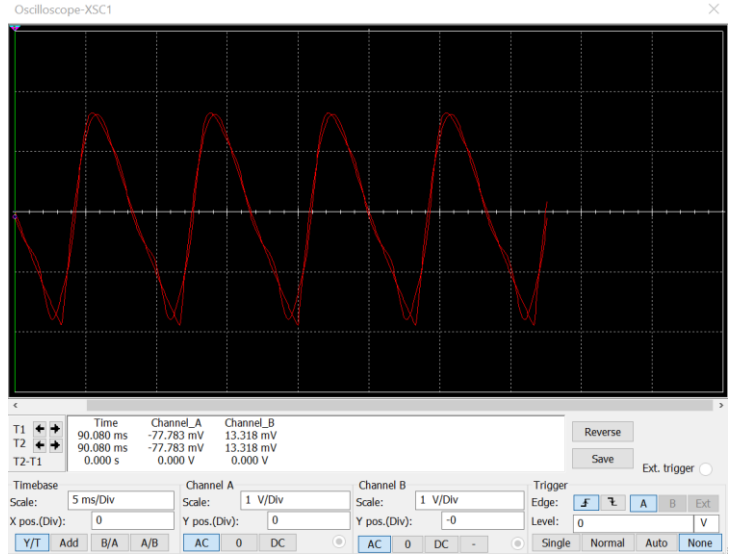
Fourier series











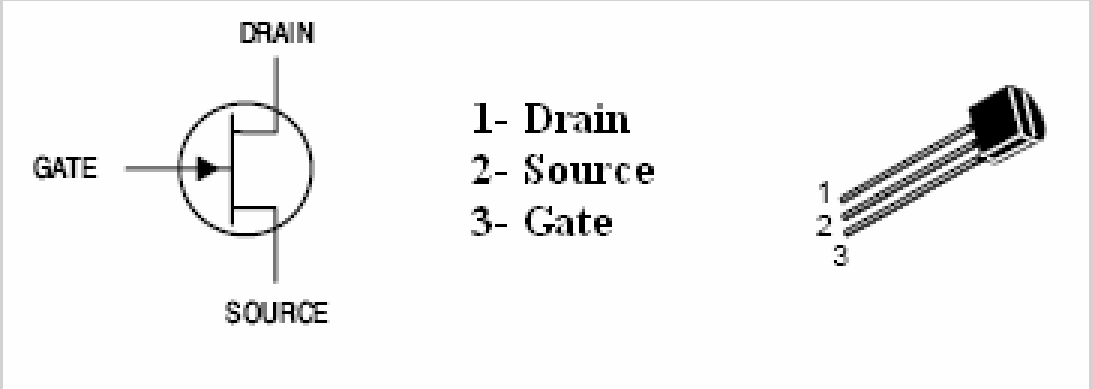
Fourier series

observations

- Initially we couldn’t get the waves to match properly and found out we were using the wrong AC power component on multisim . Once we changed it out. We were able to replicate a similar build and test compared to the video we watched.

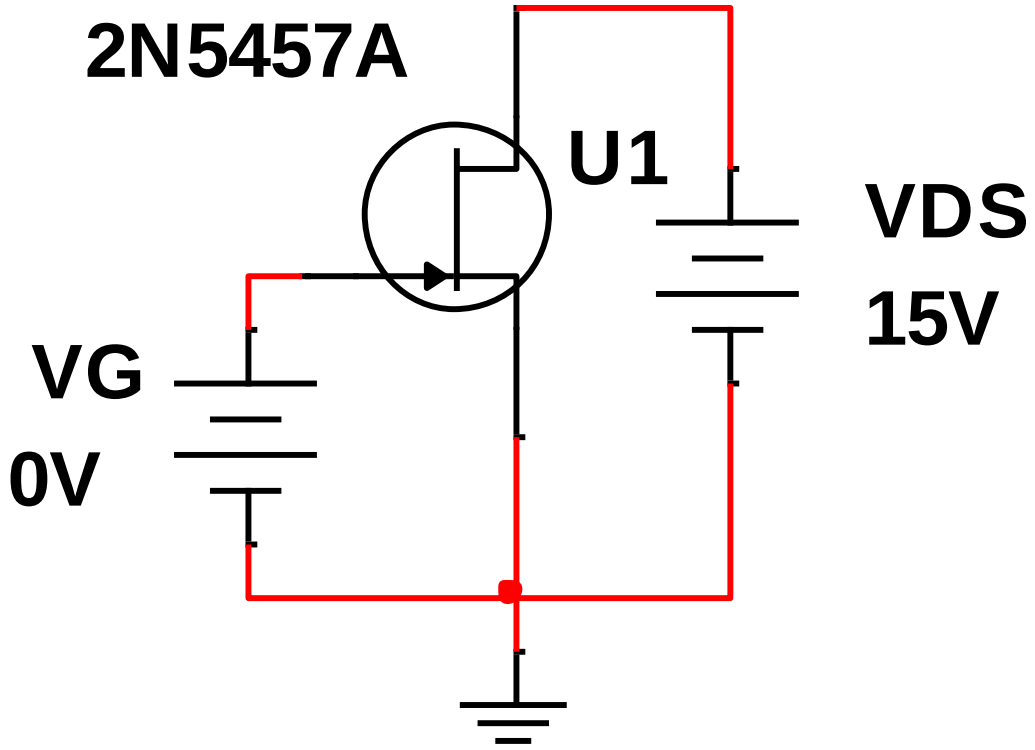
Jfet Models

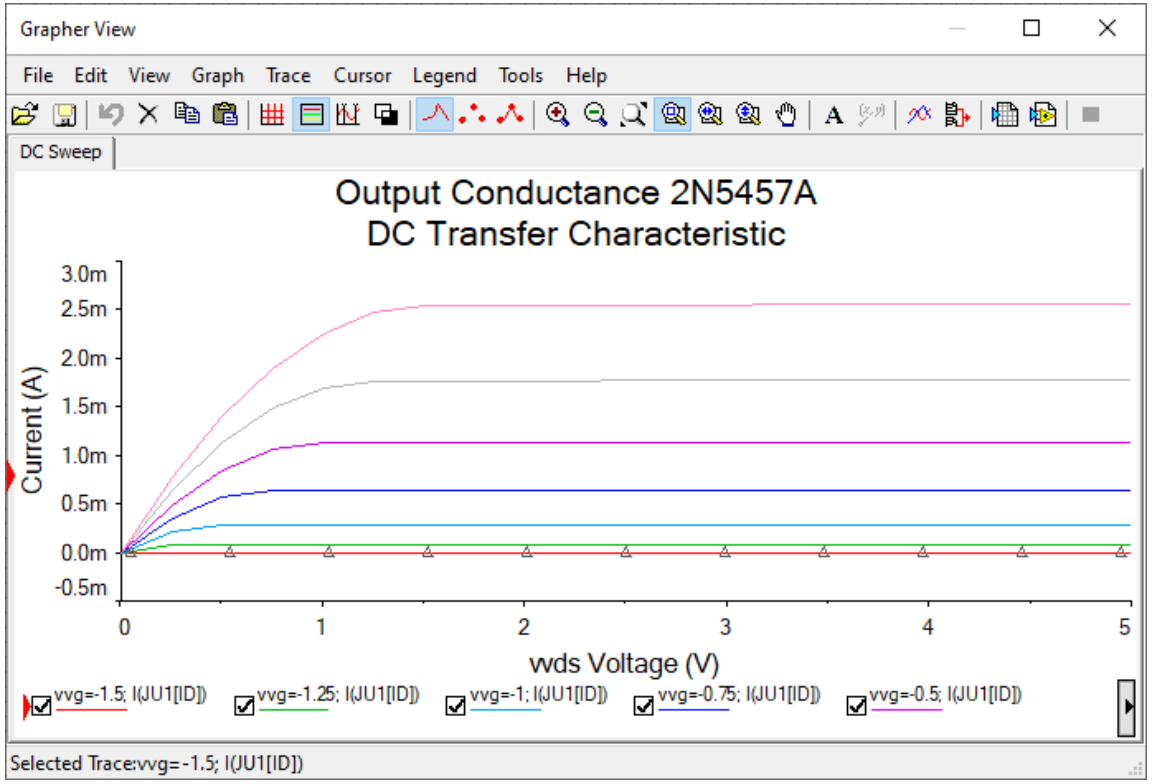
- 2N5457A
- 2N5457B
- 2N5457C

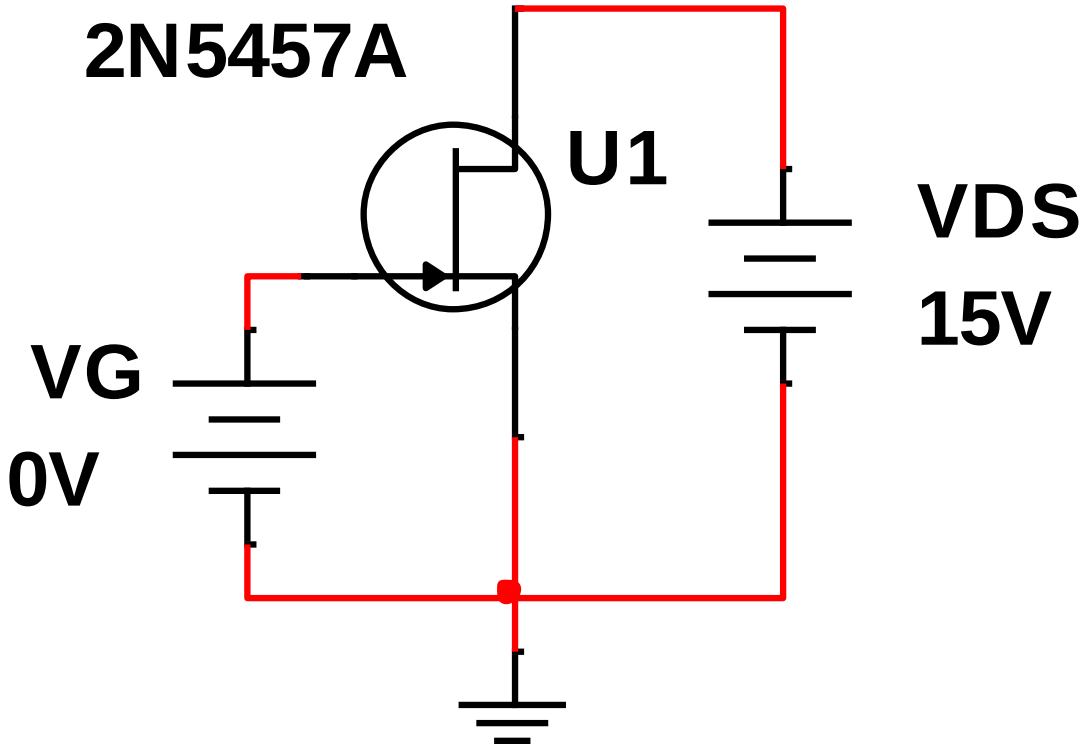


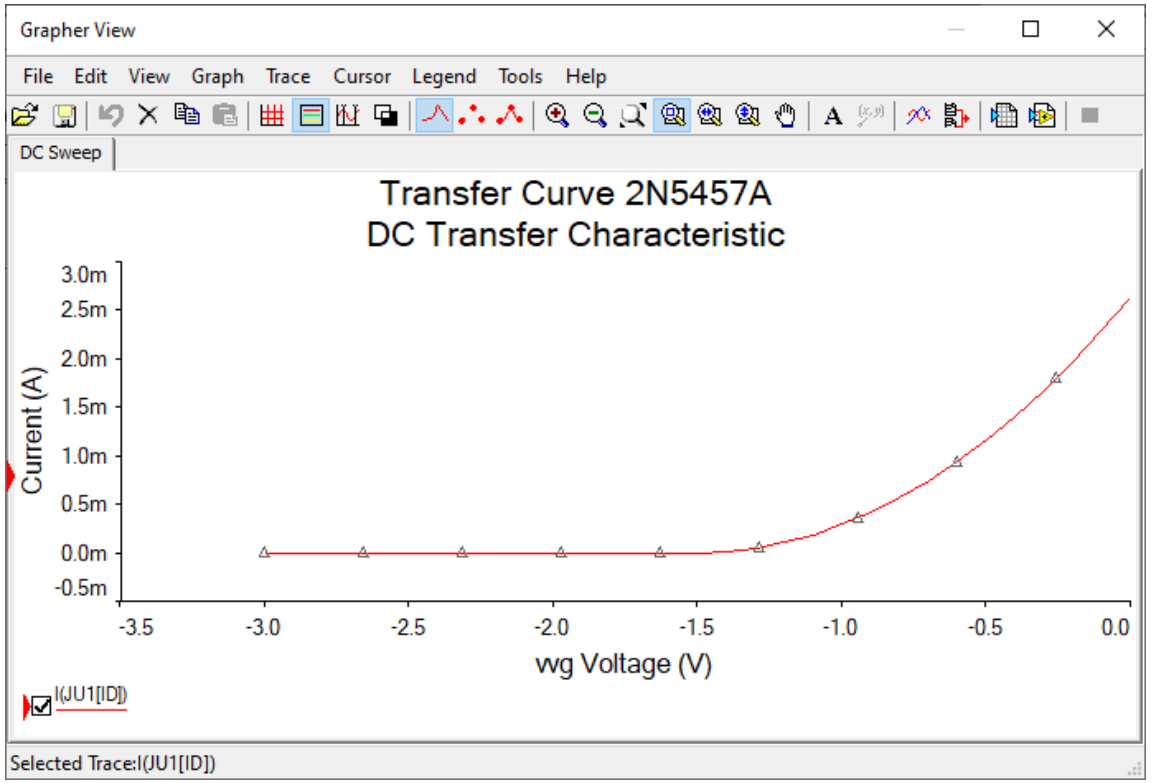
2N5457A

Output Conductance 2N5457A





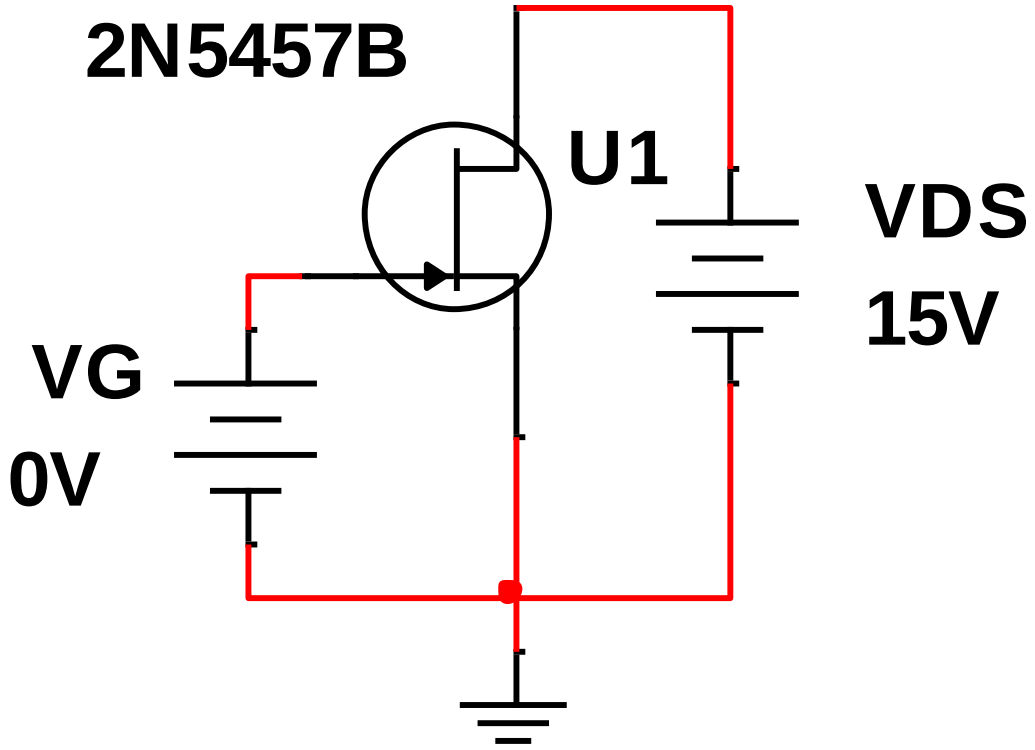


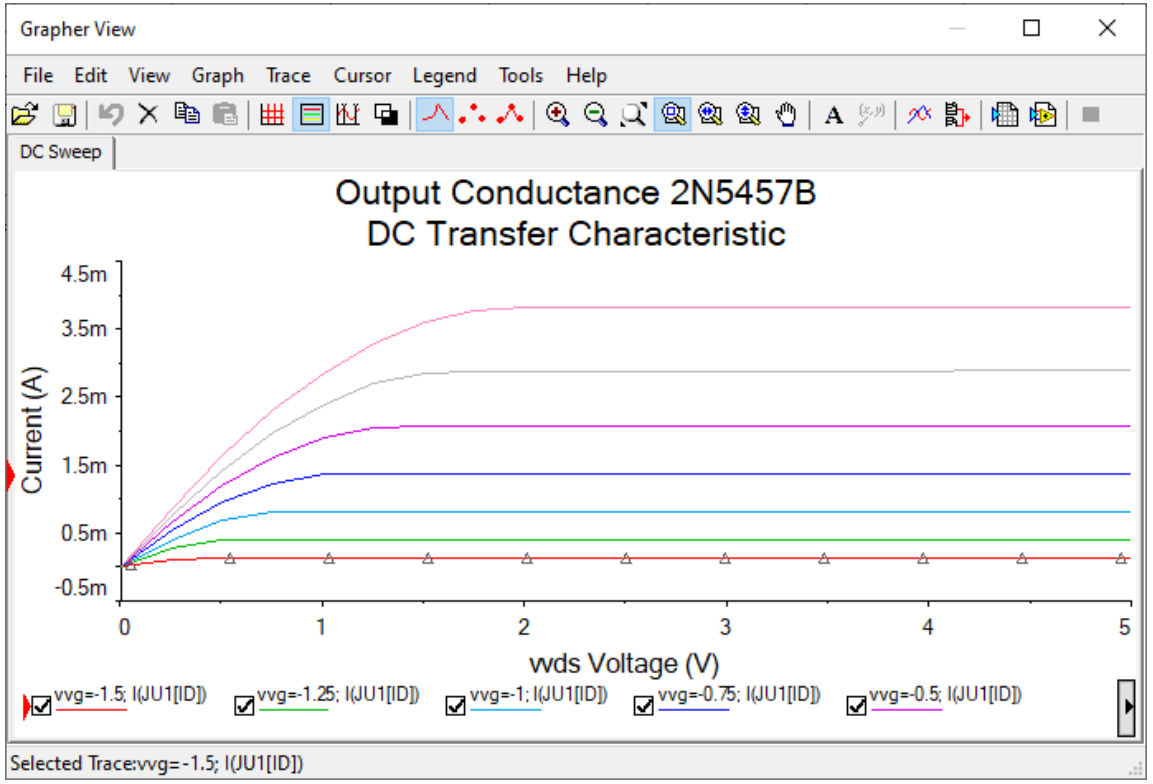


Transfer Curve 2N5457A

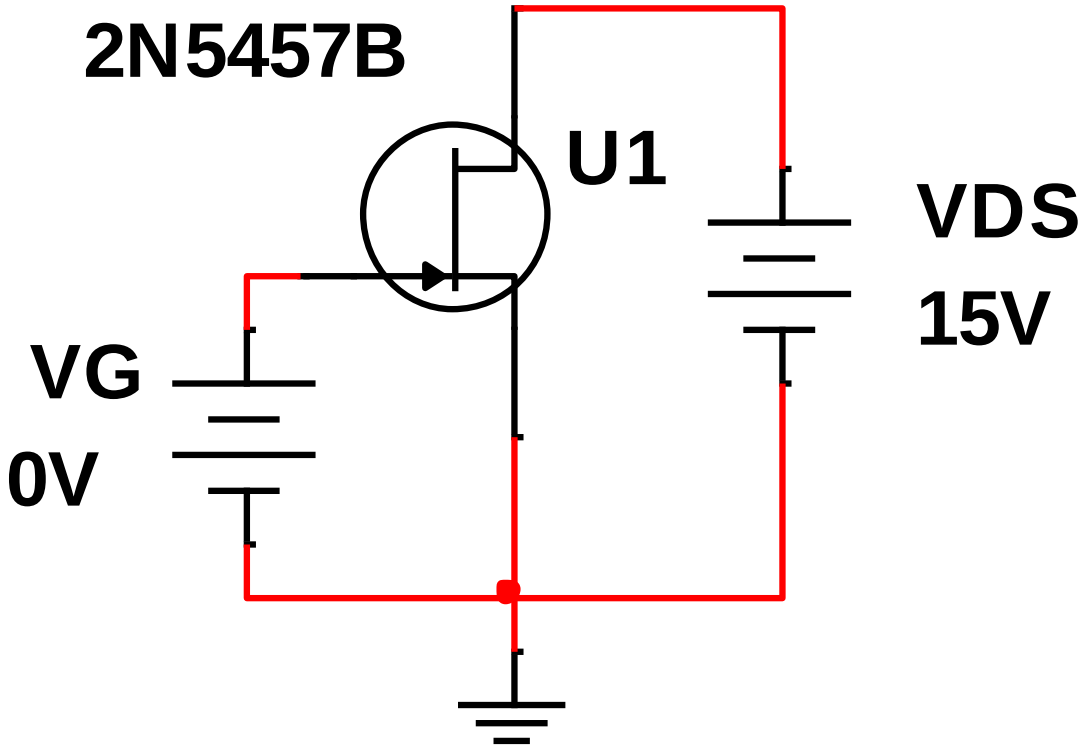
2N5457B

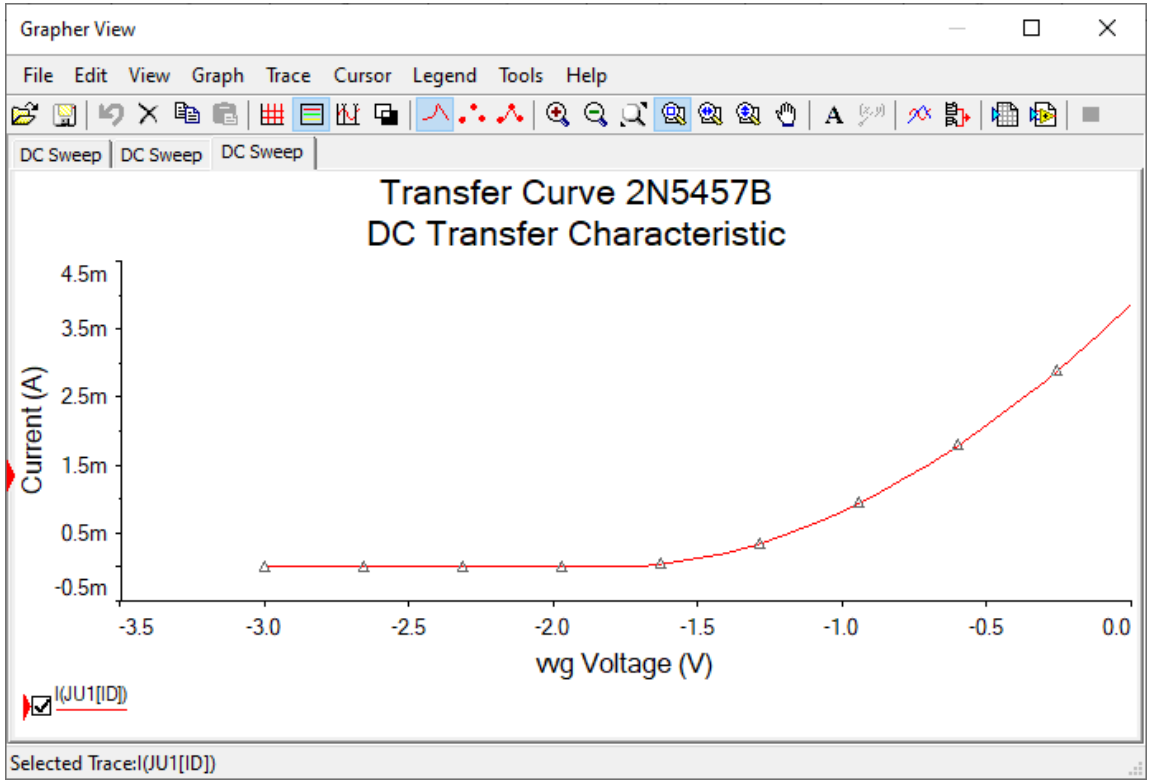
Output Conductance 2N5457B



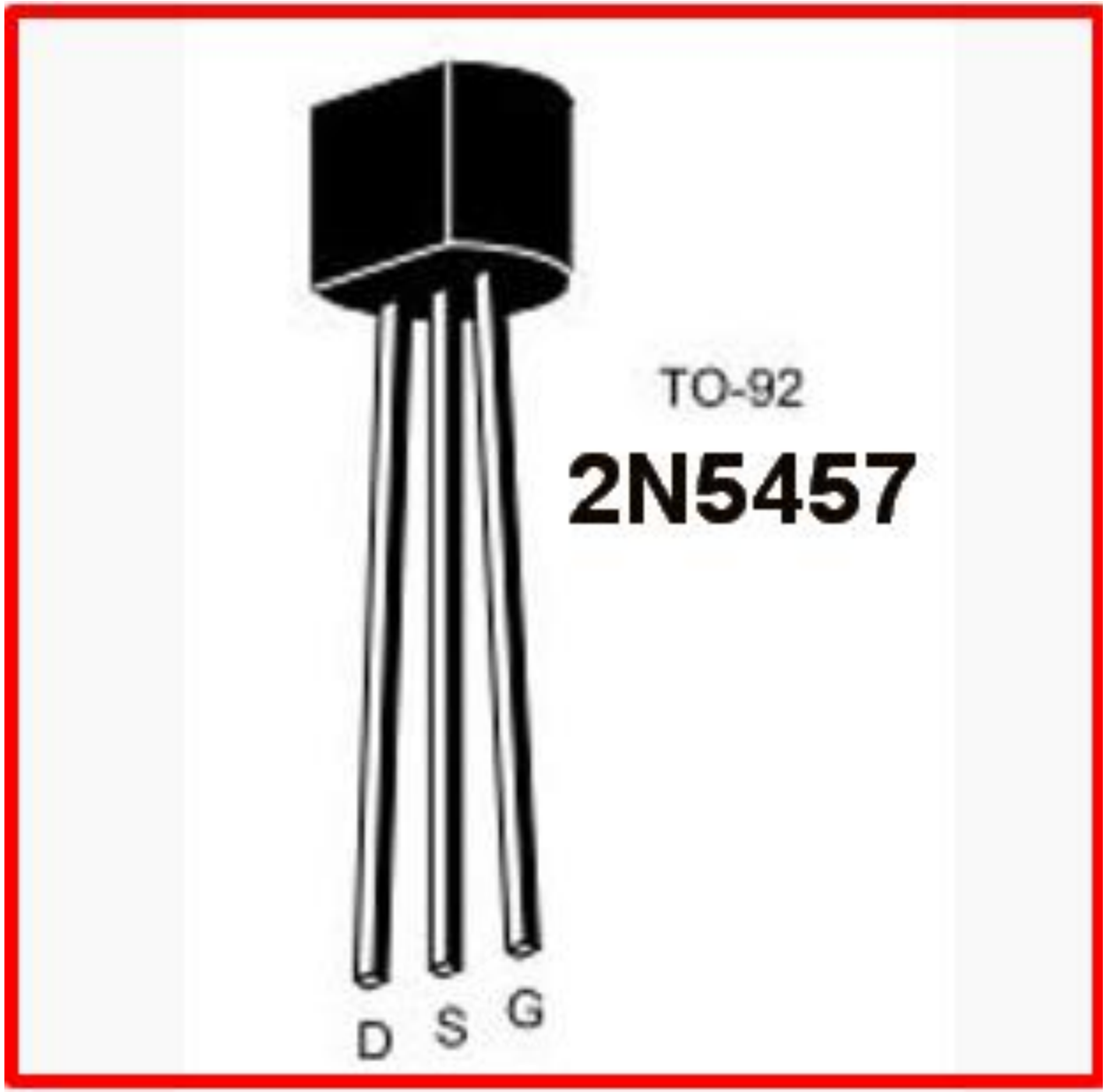


Transfer Curve 2N5457B

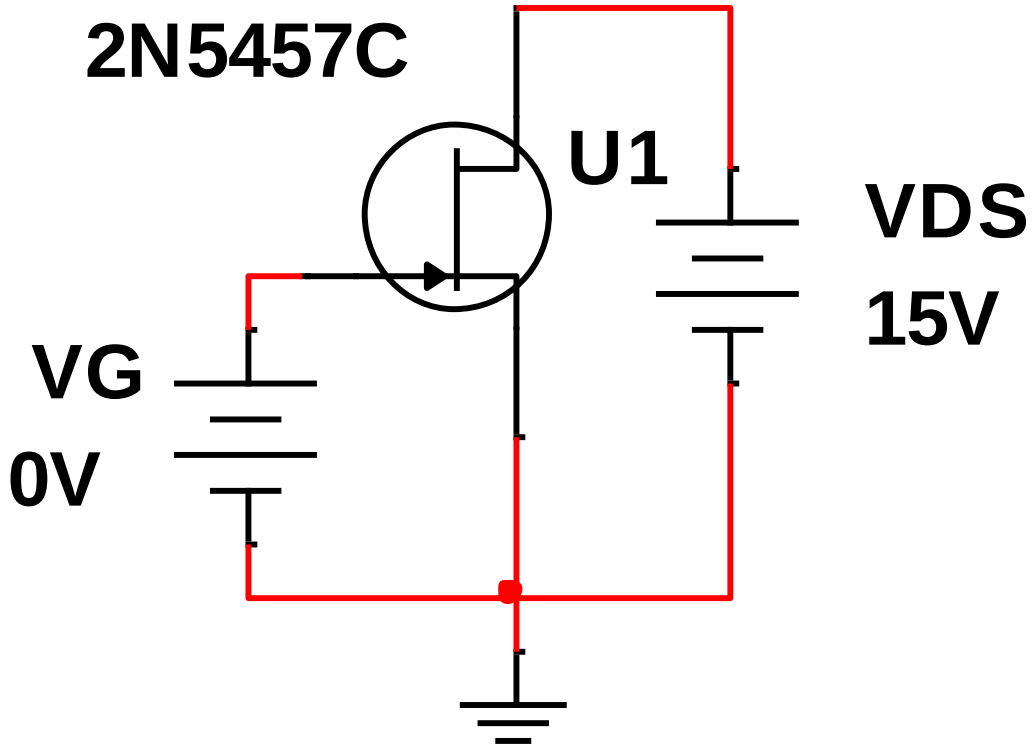


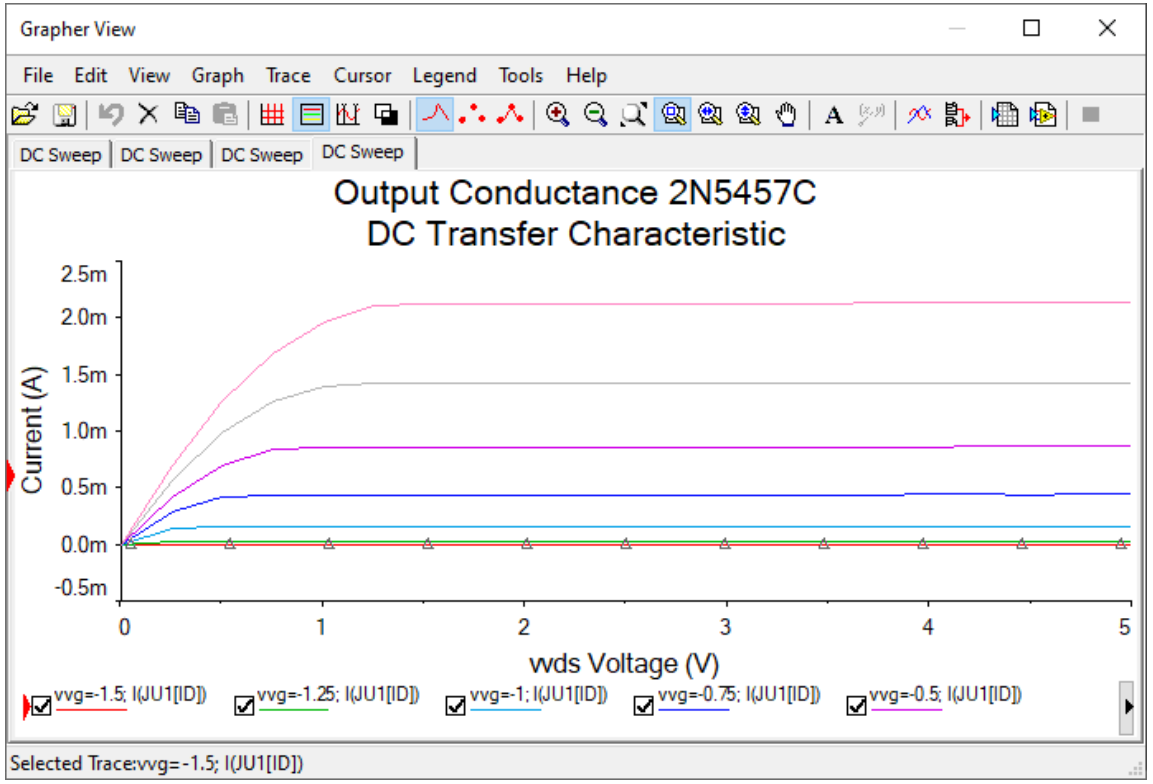


2N5457C

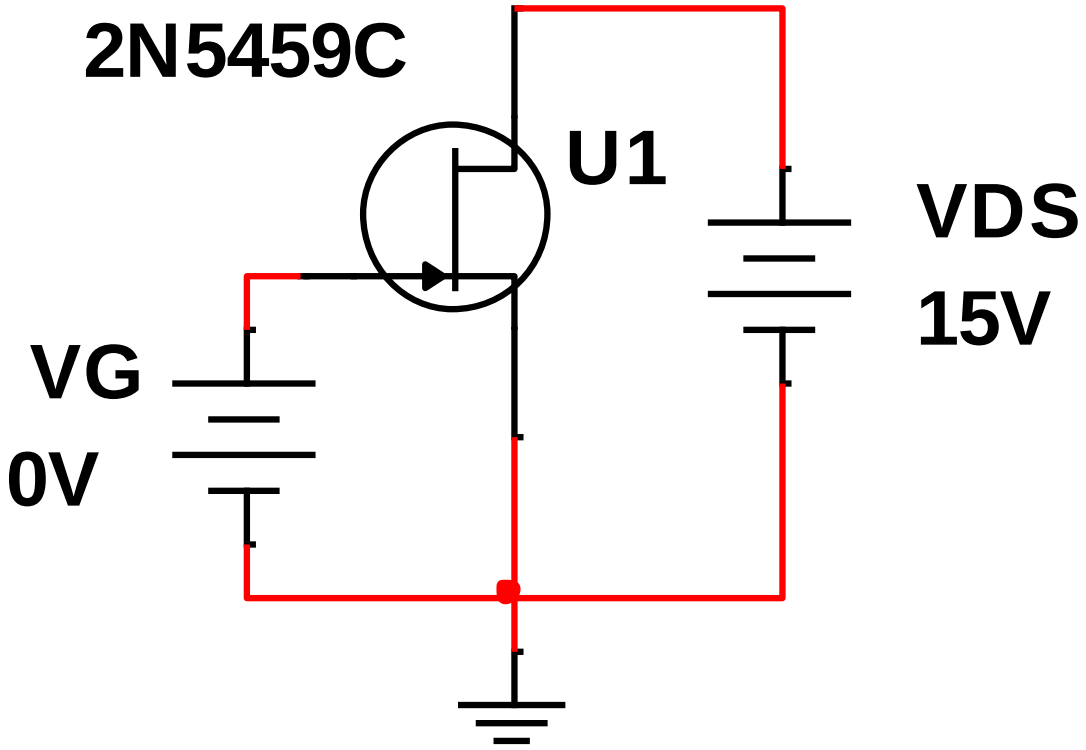


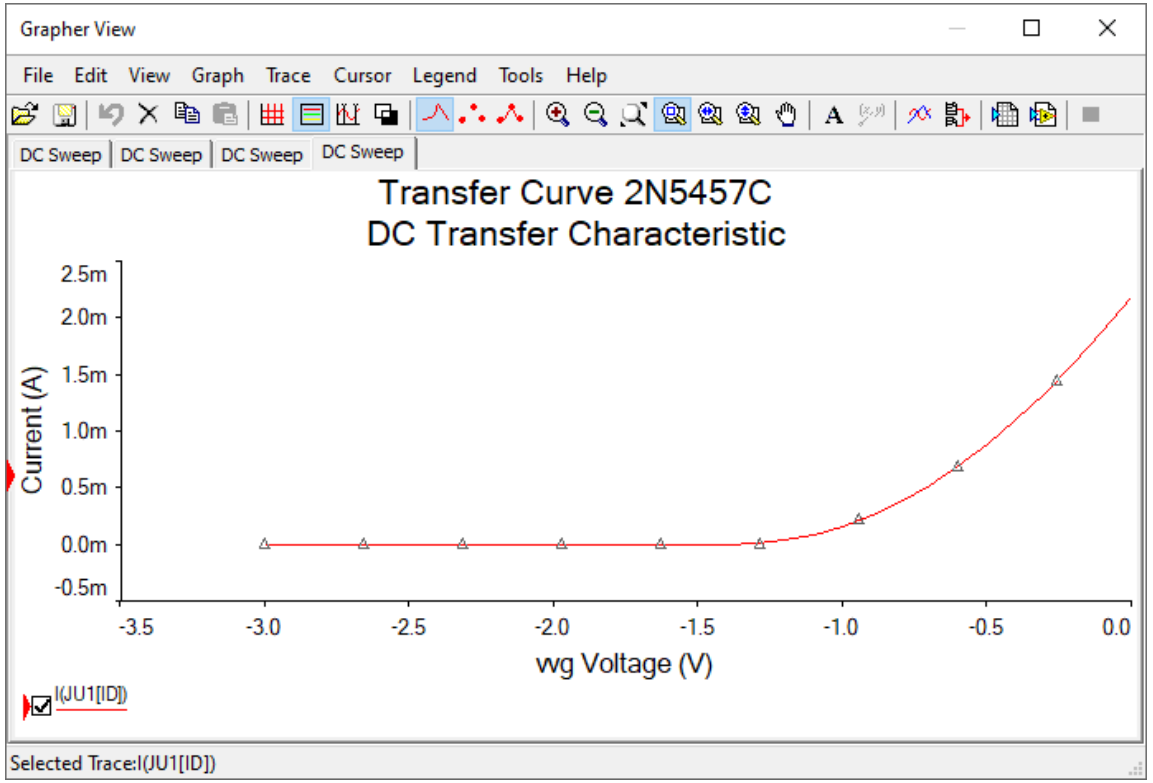
Output Conductance 2N5457C





Transfer Curve 2N5457C





Jfet observation

- While consulting with my lab partners All models of the jfet have similar reading but B has a higher Current conductance compared to A, while C has the lowest Current conductance