

Department of Computer and Electronics Engineering Technology
CEET 1140
Final Laboratory Project

Title: Filter Circuits.

Objective: The student will design and construct a band pass filter using resistors, capacitors and/or inductors. This lab counts 20 points toward your final exam score and must be accomplished individually. (10 points for the lab book entry, 10 points for a functional circuit)

Equipment: Function Generator
Oscilloscope
Proto Board

Parts: Resistors, capacitors and inductors as determined below.

Preparation: Write the title and a short description of this lab in your lab book. Make sure the page is numbered and make an entry in the table of contents for this lab.

For years, the telephone companies placed filters on every local loop (the wire that runs from the end office to your house) to filter out frequencies not in the range 300 to 3700Hz. Your task is to design and build such a filter.

Your filter should have corner frequencies at or around 300Hz and 3700 Hz. To do this, design a high pass filter with $f_c \approx 300\text{Hz}$ and a low pass filter with $f_c \approx 3700\text{Hz}$ and cascade them. (See Figures 21.33–35 in the text.)

Choose from the resistors, capacitors and inductors that are available in the supply room. (Remember you can use series and/or parallel combinations to get a specific resistance, capacitance or inductance.).

Hint: Follow the author's lead and make the impedances in the first filter substantially smaller than those in the second filter.

Draw your schematic in your lab book and analyze your circuit to find the corner frequencies (f_1 , f_2) and the bandwidth (BW). Record the analysis in your lab book and bring it, along with the parts you have chosen to your lab period.

Set up: Construct your filter circuit on your proto-board. Use the function generator to provide the input signal and use the scope to view the output signal. Turn on the function generator and configure it to produce a (roughly 1kHz) sine wave.

Procedure: Adjust the frequency to find the maximum output amplitude. Set the voltage cursors on the oscilloscope to 70.7% of that value and then adjust the frequency to find f_1 and f_2 . (We used the same technique to find f_1 , f_2 and BW in Lab 12.)

If f_1 and f_2 are within 20% of 300Hz and 3700Hz, respectively, skip this paragraph and move on to the next. If not, it is probably because the component tolerances are too large or because one of the filter stages is interfering with the other. In either case, modify your circuit so that the corner frequencies, f_1 and f_2 , are within 20% of 300Hz and 3700Hz.

Demonstrate your filter circuit to the lab instructor.

Cleanup: Turn off the power to the scope and function generator.

Conclusions: In the conclusion section, write a short summary of what you did and what you learned. Present your lab book to the lab instructor for evaluation.