

## Lab 6 - Filter Design

### Objectives

To carry out a complete filter design by doing the following steps:

1. Design a filter using a handbook approach
2. Verify the design using numerical simulation (e.g., PSpice)
3. Build the design in hardware
4. Verify that the system meets specifications by direct measurement using LabView.

The above design process will be carried out using both the Butterworth and Chebychev filter types.

### Equipment

HP1116A Function Generator  
 HP34401 Multimeter  
 Oscilloscope  
 Opamp, some capacitors and resistors (may need to buy a few)

### Pre-Lab

Do problems 11.26 and 11.29 in Eccles (these are part of a homework set, too). Verify your designs using PSpice.

Record your designs in your lab notebook and bring a photocopy of your notebook to the lecture before lab. Be sure to include plots that show your filters meet specification.

### Procedure

In lab build and test both filters by measuring their frequency response using LabView.

Present and compare your measured and simulated results by plotting them together on the same graph. You can import PSpice data into MATLAB by doing the following:

1. Attach the "PRINT1" device to your filter's output terminal. Double-click on the symbol and set the "analysis" option to "ac".

2. Run the simulation, then select "Analysis -> Examine Output". Scroll down to the numerical values, then highlight the entire set of values with your cursor and do Ctrl-C to copy them to the clipboard.
3. In MATLAB, start entering a matrix variable assignment command, e.g., `a=[` .
4. Paste the clipboard contents into MATLAB using Ctrl-V.
5. Close the variable assignment by typing `]` .
6. Plot the data using `semilogx(a(:,1),20*log10(a(:,2)))`.

### Instructor Verification

### Report

No memo is required for this lab.

# Instructor Verification

Staple this page to the end of your Lab Memo.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Butterworth filter	
Chebyshev filter	