363 Winter 2017 - due Jan. 30.

Exercise in window function design of a notch, band-elimination, or band-reject filter. It may be expedient to suitably modify the m-file for determination of a linear phase FIR bandpass filter using window function design that is given at the course web site.

For uses of a notch filter see

http://www.electronicshub.org/band-stop-filter/#Applications_of_the_Band_Stop_filter

https://en.wikipedia.org/wiki/Band-stop_filter

Here all frequencies presuppose a sampling frequency $f_s = 1$.

We want a filter that rejects the frequency $f = 0.125$ and its immediate neighborhood. Specifically, the specifications are stopband [0.11 , 0.14], passbands [0 , 0.06] and [0.19 , 0.5].

Use a Hamming window design method to determine coefficients of the filter.

From the specifications determine a minimum window length N+1. If you get an even length (odd N) then increase N by 1 so that you have an odd length (Type 1) filter. Why am I telling you to do this? What will be the delay λ associated with your filter? Answer these two questions in what you hand in.

Decide what the frequency response of the ideal, infinite length filter meeting specifications ought to be in view of the intention to use a Hamming window design method. Find a formula for the coefficients of this ideal filter. Set `hideal` = the relevant N+1 of these coefficients and then (assuming `hideal` is a row vector) say

```
h=hideal.*hamming(N+1)';
```

to arrive at the desired filter coefficients. Print out these coefficients.

Using `freqzdB` determine and plot the magnitude function of the filter for the four frequency ranges [0 , 0.5], [0 , 0.06], [0.11 , 0.14] and [0.19 , 0.5], to be printed.

Finally, say `zplane(h)` to get a plot of the zeroes of the filter, to be printed.

Hand in the printout of your coefficients, the four graphs and one `zplane` plot, your m-files and/or diary files that show what you did, and your algebraic work to determine the filter length and the ideal filter coefficients.

1/12/17