

## Assignment for DSP lecture

1. Use Matlab to compute the order of the filter required for a given performance specification. Let us assume we want a Butterworth filter, with a response that is 1 dB down at 1000 Hz, and at least 20 dB down at 3000 Hz. (The result is not used for the rest of this exercise.)
2. Create a signal  $x(t)$  which is a sum of two sinusoids with frequencies 5Hz and 15Hz.
3. Plot  $x(t)$  and  $X(f)$ . Use time and frequency as x-axis while plotting, not the sample number.
4. Create a fourth-order Butterworth IIR low pass filter with cutoff frequency of 10Hz and plot the response of the filter. Change the order of the filter to 20 and note how the frequency response changes. Note that the standard Matlab filter commands such as “Butter” produce an IIR filter by default. Different commands are used for FIR filters. Refer to Matlab Help.
5. Pass the signal  $x(t)$  through the IIR filter and plot the output.
6. Create a fourth order FIR low pass filter with cutoff frequency of 10 Hz and plot the response of the filter.
7. Repeat the experiment with an FIR filter of order 20 and note the performance difference.