A Band Pass Filter allows a specific range of frequencies to pass, while blocking lower and higher frequencies. It passes frequencies between two cut-off frequencies while attenuating frequencies outside the cut-off frequencies.

A good application of a band pass filter is in audio signal processing, where a specific range of desired frequencies of sound are passed while blocking the rest. Another application is in the selection of a specific signal from a range of signals in communication systems.

A band pass filter may be constructed by cascading a High Pass RL filter with a roll-off frequency $f_L$ and a Low Pass RC filter with a roll-off frequency $f_H$. The Lower cut-off frequency is given as: $f_L = \frac{R}{2\pi L}$ and the higher cut-off frequency is given as: $f_H = \frac{1}{2\pi RC}$. The Band Width of the frequencies passed is given by: $BW = f_H - f_L$

1) Build the circuit shown in figure, preferably on your solderless breadboard.

![Figure 1 LC band pass filter](image)

2) Connect waveform generator 1 and the two scope channels to the RC circuit as shown.

3) Start the Waveforms software.

4) Start up the WaveGen tool. In the AWG window, set the excitation signal for the band pass filter circuit: Shape = Sine, Frequency = 63KHz, Amplitude = 2V, Offset = 0V, Phase = 0. Click Run All or Run AWG1.

5) Start the Scope tool. Set the scope for a good view of the excitation and output signals: Trigger Mode = Auto, Trigger Source = Channel 1, Trigger Cond. = Rising, Trigger Level = 0V, Time Base = 5us/div, Channel 1 and Channel 2 Offset = 0V, Range = 1V/div. Click Run.
6) With the measurements display open, compute 70% of input amplitude (C1) and obtain the frequencies at which this occurs on the output signal (C2). (Note that it occurs twice on a band pass filter, near lower cutoff and near upper cutoff). This gives the 3 dB cut-off frequencies for the Band Pass filter you constructed.

**Using the Bode Analyzer:**

The Bode Analyzer is used to plot the frequency response of an AC circuit. It displays the Bode Plots which are the magnitude and the phase versus the frequency of a given network. The procedure is as follows:

1) Select the Bode Transfer Function instrument from the Miscellaneous Instruments tab in the main launcher window. Set the frequency sweep mode to Log 3 decades, and the magnitude representation to Show dB. Set the End Frequency to 1MHz, the amplitude to 2 Volts and the offset to 0V. Set the run time to 10s and the max gain to 5 dB. Hit the green Run Single button. You should see the frequency response in dB of the voltage across the inductor and capacitor.