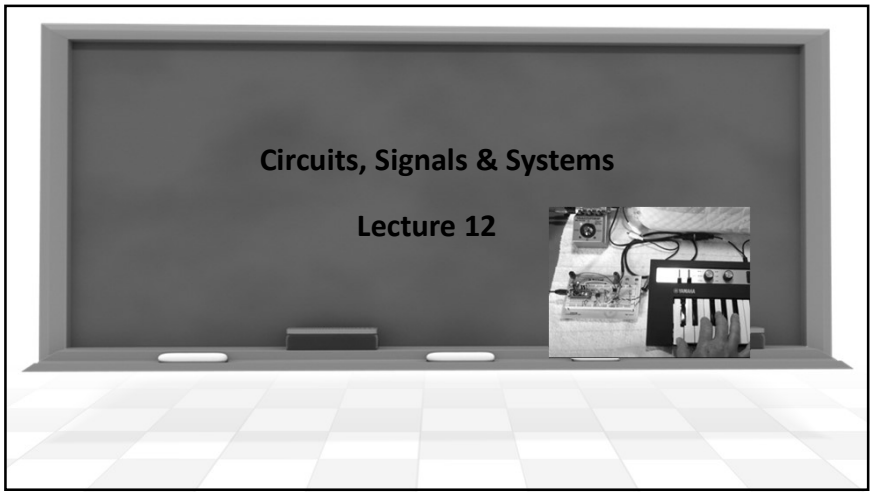
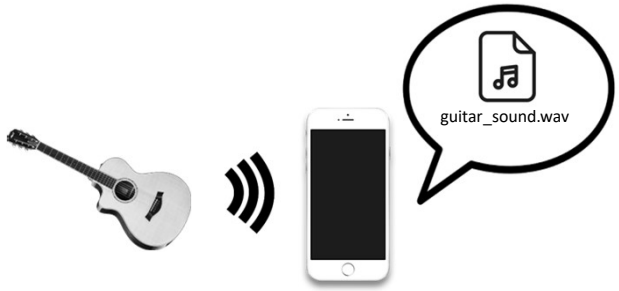
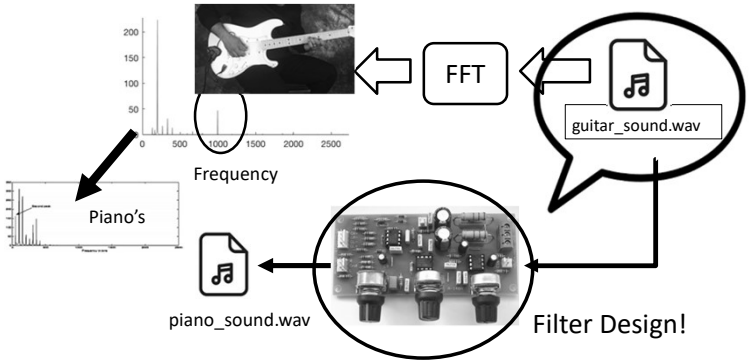


•**Practical Application**



•**Practical Application**

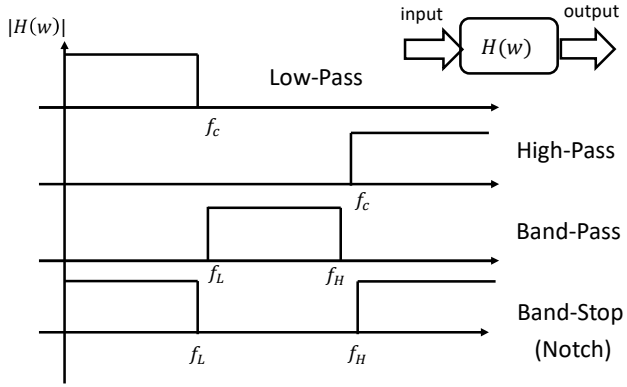


•**Filter Design**



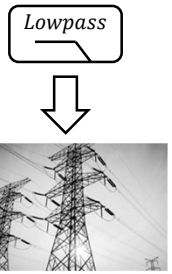
- Different Filter Types
- The Order of the Filter
- Well-known Filter Characteristics
- A Complete Example

•Basic Filters in an Ideal Case



•Basic Filters in Action – Lowpass Filter







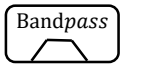
50/60Hz

Noise:



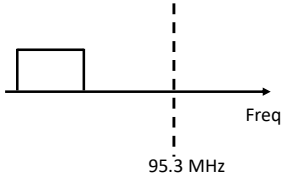


•Basic Filters in Action – Bandpass Filter

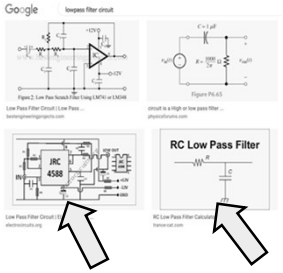


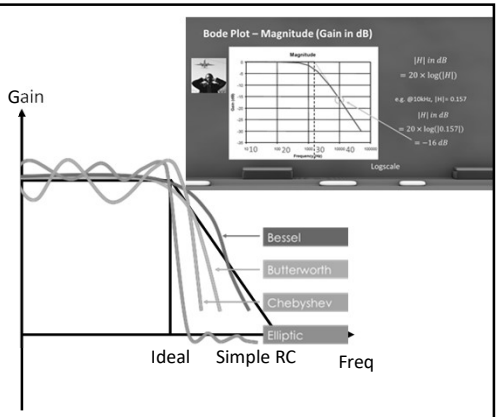






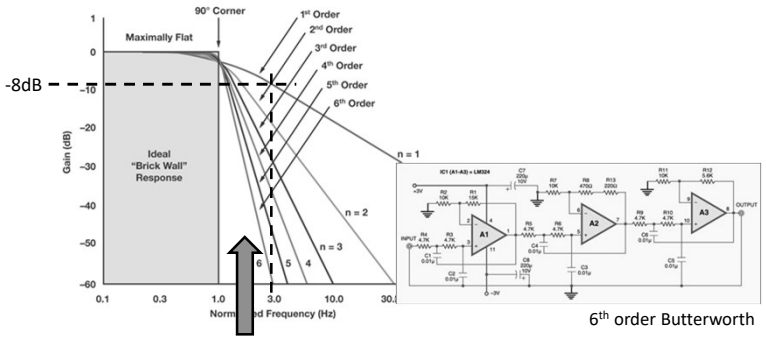
•Well-Known Filters





They give us different characteristics!

•Order of the Filter



6th order Butterworth

Faster Roll-off, but EXPENSIVE

A Complete Example



Options:

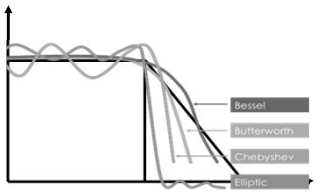
1. Using a Digital Filter (Post Production)
2. Add an Analogue Filter in our Microphone (Real-Time)

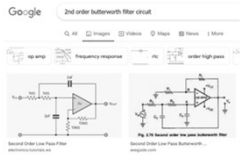
Analog Filter Design

1. What for? - Adult voice: 85 – 255Hz.

2. Filter Requirement: 2nd order LP, $f_c = 600Hz$

3. Filter Type





Analog Filter Design

We can choose:

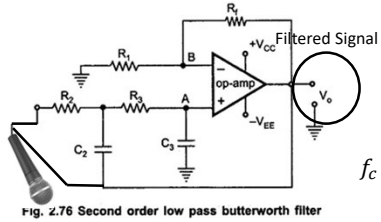


Fig. 2.76 Second order low pass butterworth filter

$$R_f = 500\Omega$$

$$R_1 = 500k\Omega$$

$$Gain \cong 1$$

$$f_c = \frac{1}{2\pi\sqrt{R_2R_3C_2C_3}} = 600$$

Choose $R_2 = R_3 = 10k\Omega$

Choose $C_2 = C_3 = C$

$$f_c = \frac{1}{2\pi\sqrt{R_2R_3C_2C_3}}, \text{Gain} = 1 + \frac{R_f}{R_1}$$

$$\Rightarrow C_2 = C_3 = 26.5nF$$

Analog Filter Design Cont.

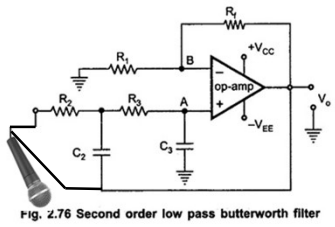
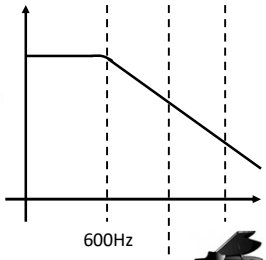


Fig. 2.76 Second order low pass butterworth filter

Our 2nd Order LP Butterworth

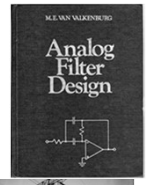


Not a good design!



•What we have learned

- How to read Filter Profile (i.e. Freq Response)
- Lowpass, Highpass, Bandpass & Bandstop
- Order of the filters
- Well-known Filter Designs
- Digital vs Analog Filters





Note the danger of HV power system.

Try in simulation and always wear protective gears.