Week 8 - Analysis Active Filters - Op-Amps
General

Lowpass Functions

$$Z_f = \frac{R_2}{R_1}$$

$$Z_{in} = 1 + j\omega R_2 C_1)$$

$$G(\omega) = -\frac{R2}{R1}\frac{1}{æ\omega R_2 C_1 + 1}$$

Bandpass Functions (Part 1 and Part 2)

$$Z_f = R_2 \parallel \frac{1}{j\omega C_2}$$

$$Z_{in} = R_1 + \frac{1}{j\omega C_1}$$

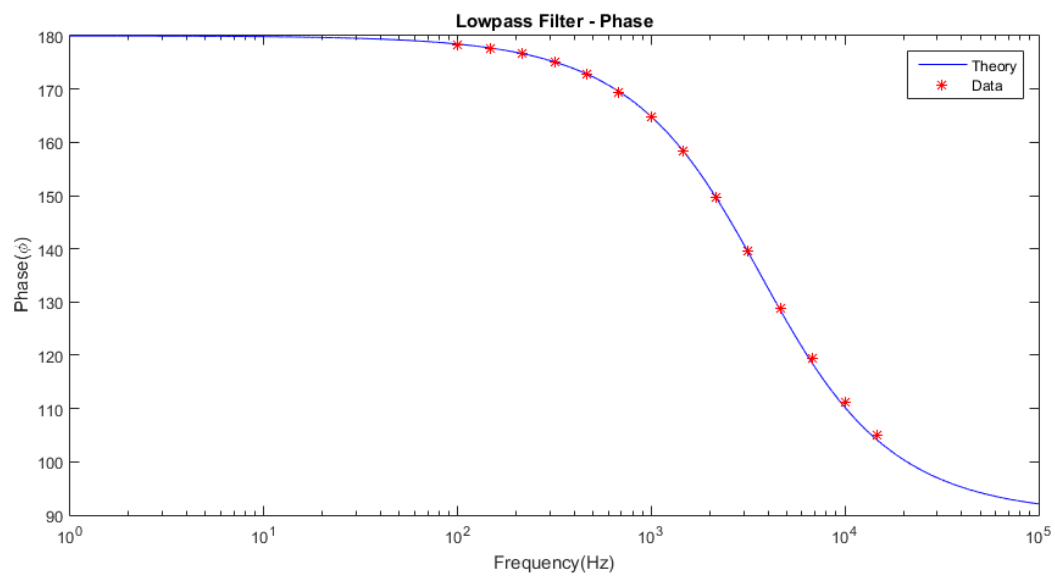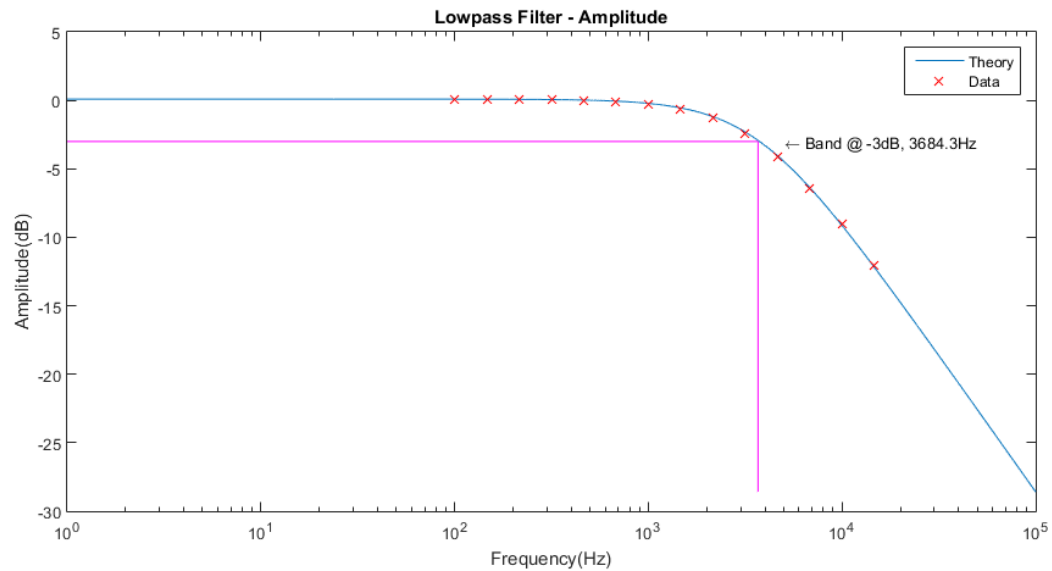$$G(\omega) = -\frac{j\omega R_2 C_1}{(j\omega R_1 C_1 + 1)(j\omega C_2 R_2 + 1)}$$

Lowpass Filter

$R_1 = 4506\Omega$, $R_2 = 4552\Omega$, $C_1 = 9.49 \times 10^{-9}$ F

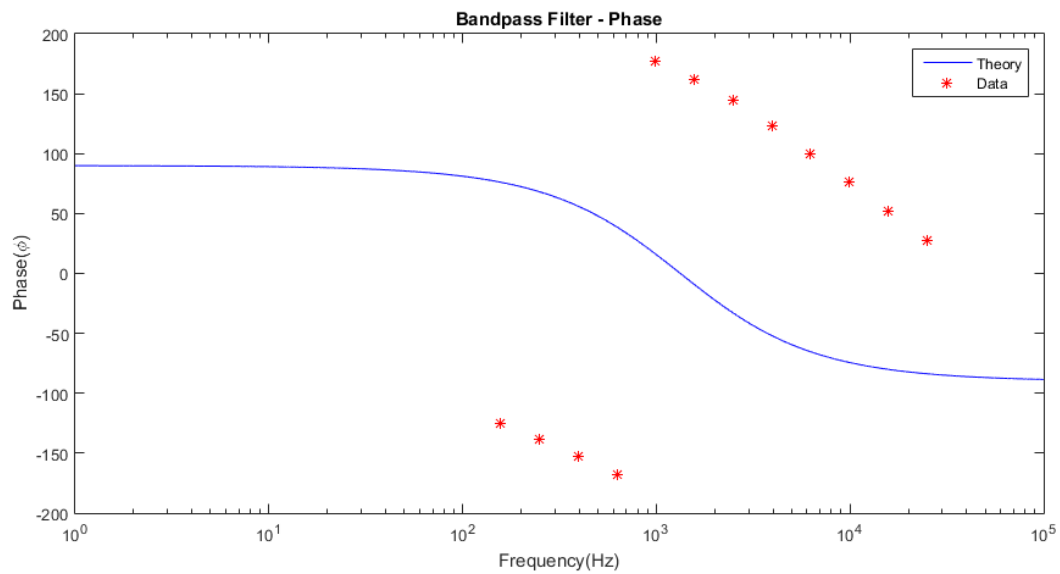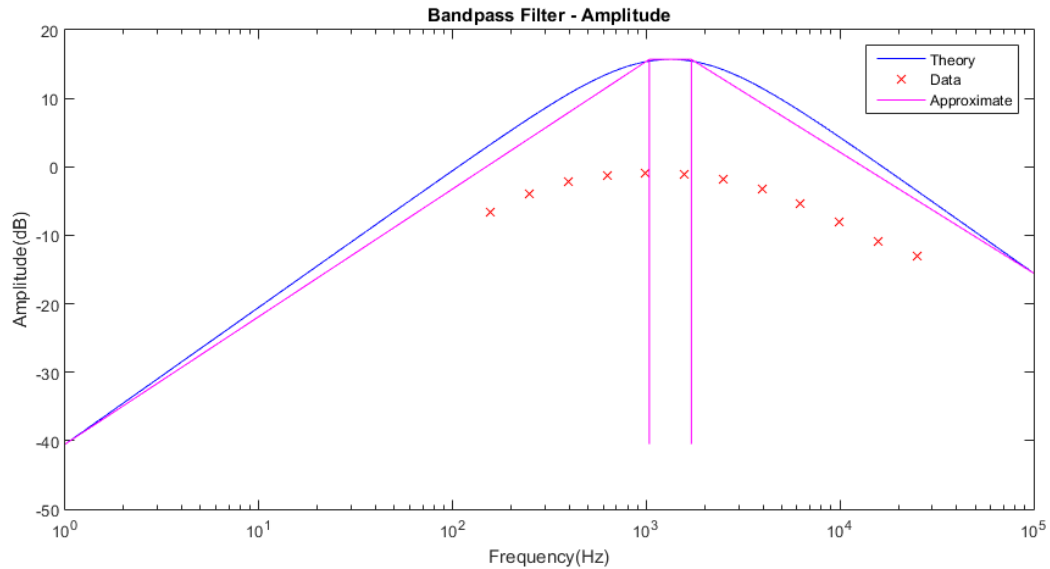Gain $= -1.01021$, Gain dB $= 0.0882213$

Band $= 3.68 \times 10^3 Hz$ @ -3dB

Functions

Lowpass Filter - Amplitude

Lowpass Filter - Phase

Bandpass Filter

$R_1 = 465\Omega$, $R_2 = 4552\Omega$, $C_1 = 3.3 \times 10^{-7}$ F, $C_2 = 2.047 \times 10^{-8}$ F

Gain = 9.7892 , Gain dB = 15.6934

Band1 = $\frac{1}{465 \cdot 3.3 \times 10^{-07}} = 1.037 \times 10^3$Hz

Band 2 = $\frac{1}{4552\Omega \cdot 2.047 \times 10^{-08}F} = 1.71 \times 10^3$Hz

Bandpass Filter - Part 2

Chose $R_1 = R_2 = 10\Omega$
$C_1 = 1.59 \times 10^{-8}$ F, $C_2 = 1.59 \times 10^{-9}$ F
Gain $= 1$, Gain dB $= 0$
Band1 $= 10000$Hz
Band2 $= 100000$Hz