

EE387 – LAB 04  
FILTER DESIGN USING MATLAB

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## Exercise 01

1. Design the Butterworth filter with the following specifications:  $F_p = 1000$  Hz;  $F_s = 5000$  Hz;

(It is assumed that this is a low pass filter and the sampling frequency of the digital system is 10kHz)

### **ex1.m**

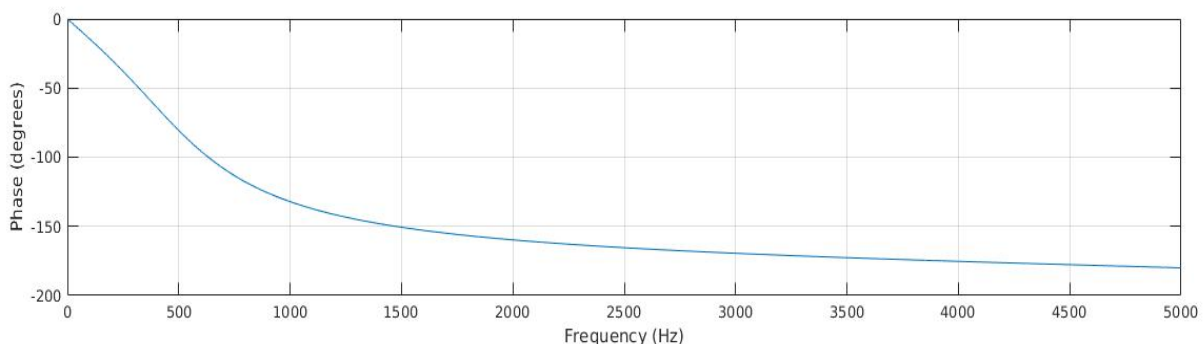
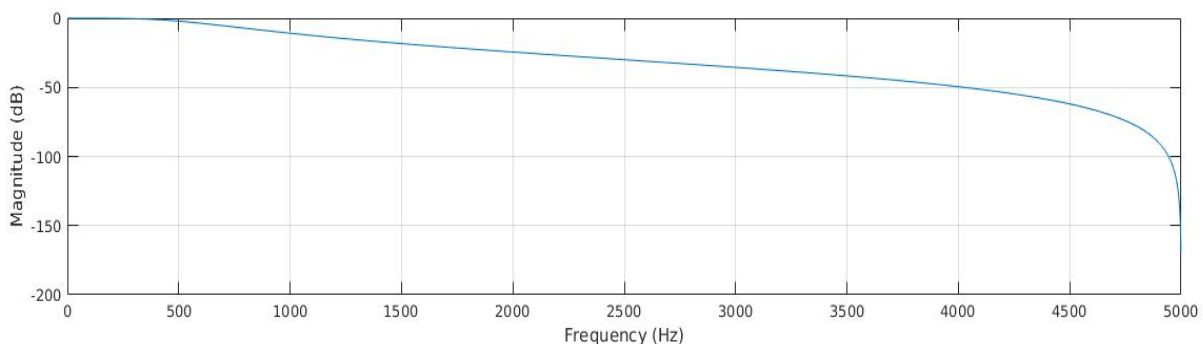
```
% EE387 Lab04  
% E/14/158  
% 22-01-2019
```

```
clear all;  
close all;  
Fp=1000;Fs=5000;Fsample=10000;
```

```
Wp=Fp/Fsample; %Multiplying by 2pi is not required since it cancels out  
Ws=Fs/Fsample;
```

```
[N,Wn]=buttord(Wp,Ws,3,30);  
[zeros_,poles_,scale_]=butter(N,Wn);  
[a,b]=butter(N,Wn);
```

```
tf=zpk(zeros_,poles_,scale_);  
bode(tf);  
figure  
freqz(a,b,5000,Fsample)
```



## Exercise 02

2. Design the Butterworth filter with  $F_p = 1000$  Hz,  $N = 4$ .

### **ex2.m**

```
% EE387 Lab04
```

```
% E/14/158
```

```
% 22-01-2019
```

```
clear all;
```

```
close all;
```

```
N=4;
```

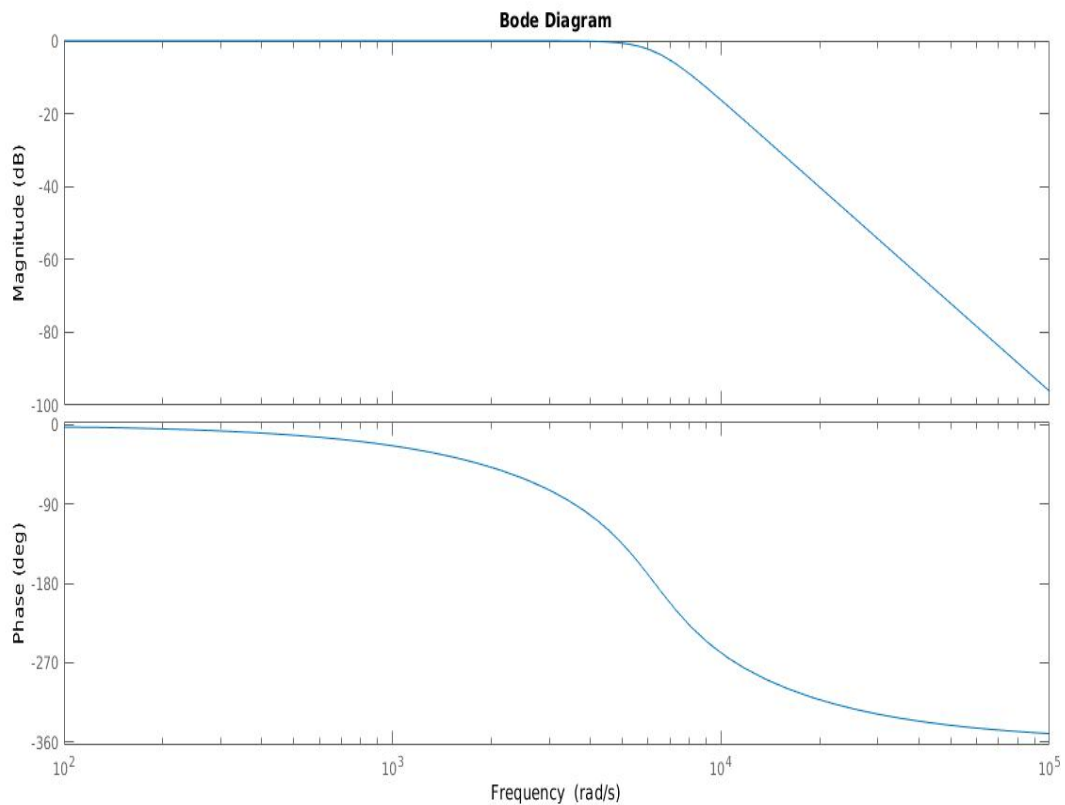
```
Fp=1000;
```

```
Wp=2*pi*Fp;
```

```
[num,den]=butter(N,Wp,'s');
```

```
fil=tf(num,den);
```

```
bode(fil);
```



## Exercise 03

3. Design Chebyshev Type 1 filter with  $N = 4$ ,  $R_p = 2$  ;  $F_p = 1000$ .

### **ex3.m**

```
% EE387 Lab04
```

```
% E/14/158
```

```
% 22-01-2019
```

```
clear all;
```

```
close all;
```

```
N=4;
```

```
Rp=2;
```

```
fp=1000;
```

```
Wp=2*pi*fp;
```

```
[num,den]=cheby1(N,Rp,Wp,'s');
```

```
fil=tf(num,den);
```

```
bode(fil);
```

