Program:

```
import numpy as np
import matplotlib.pyplot as plt
from scipy import signal
FS=8000
fp=500
fs=2000
wp=fp/(FS/2)
ws=fs/(FS/2)
Td=2
alphap=3
alphas=20
omega_p=(2/Td)*np.tan(wp/2)
omega_s=(2/Td)*np.tan(ws/2)
(N,Wn)=signal.buttord(omega_p,omega_s,alphap,alphas,analog=True)
print("Order of the filter =",N)
print("Cut-off frequency ={:.3f} rad/s".format(Wn))
b,a=signal.butter(N,Wn,'Low',analog=True)
print("\nNumerator coefficients (b) of H(s)",b)
print("\nDenominator coefficients (a) of H(s)",a)
z,p= signal.bilinear(b,a,FS)
w,h= signal.freqz(z,p,512)
plt.semilogx(w/max(w),20*np.log10(abs(h)))
plt.title("Butterworth Lowpass Filter Frequency Response")
plt.xlabel("Normalized Frequency [pi radians/sample]")
plt.ylabel("Amplitude [dB]")
plt.grid(which='both',axis='both')
plt.axvline(100,color='red')
plt.show()
```

Output:

Order of the filter = 2

Cut-off frequency =0.063 rad/s

Numerator coefficients (b) of H(s) [0.00392576]

Denominator coefficients (a) of H(s) [1.0.08860875 0.00392576]