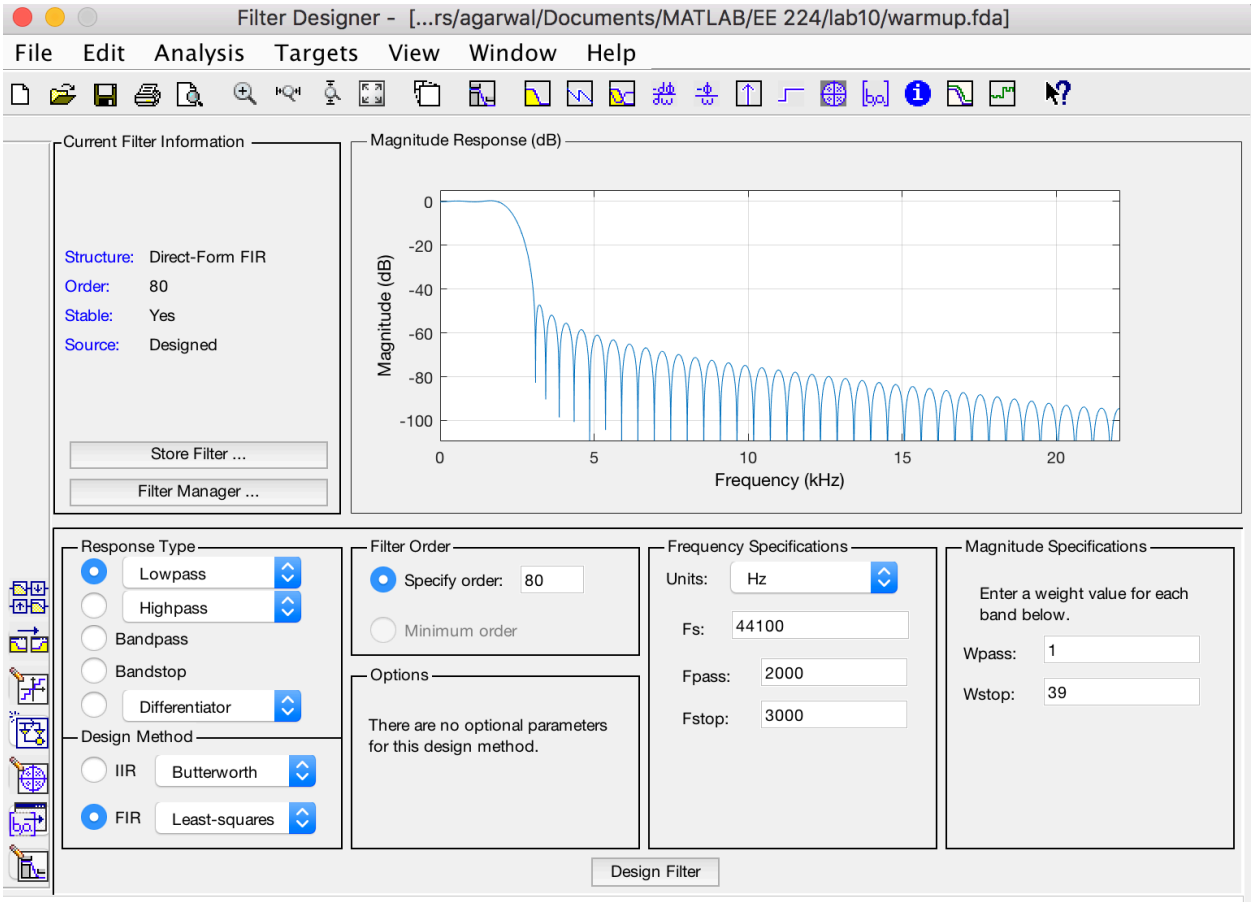
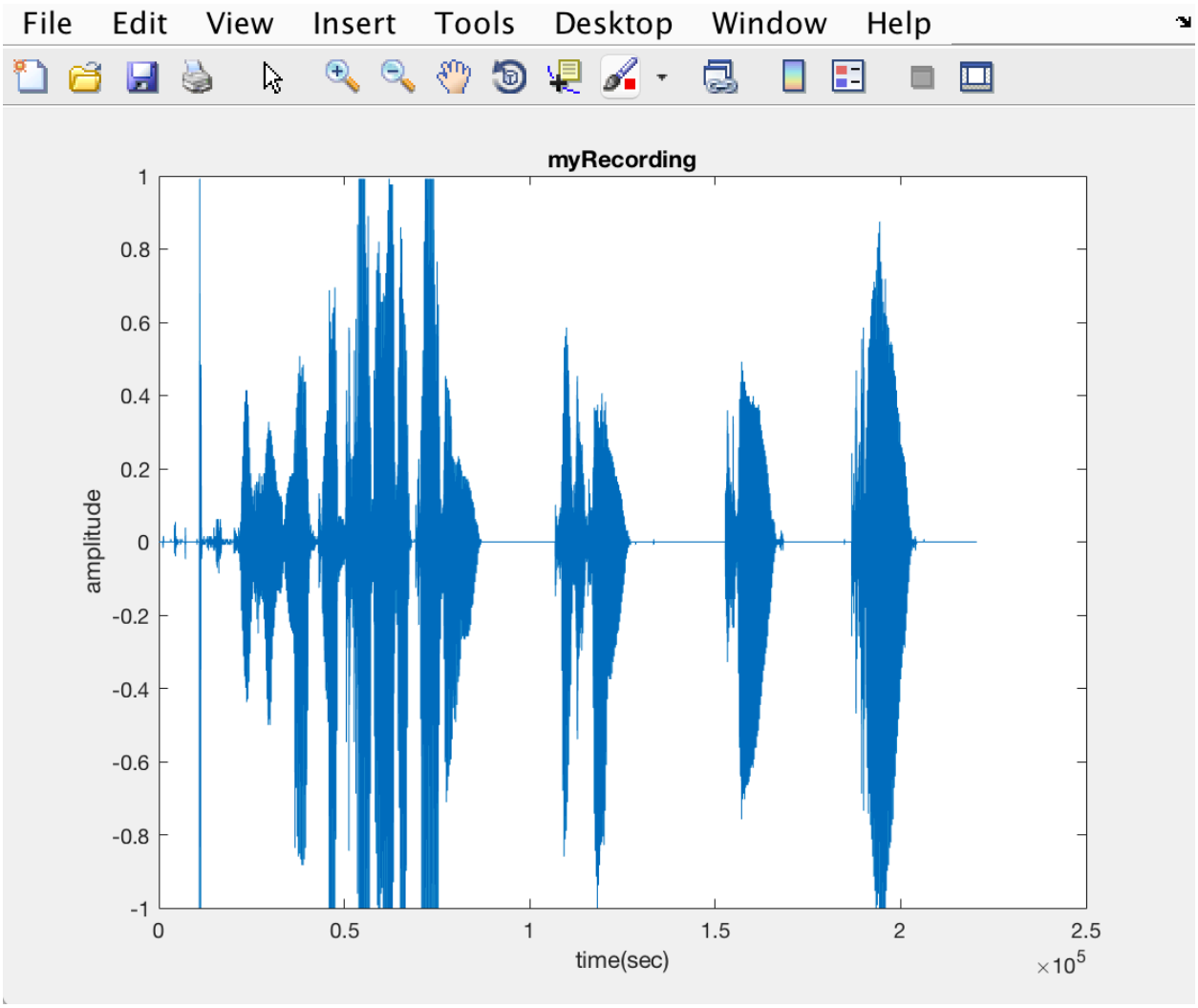
1. **Introduction:** In this lab, we learnt about the amplitude modulation, and demodulation of voice signal.

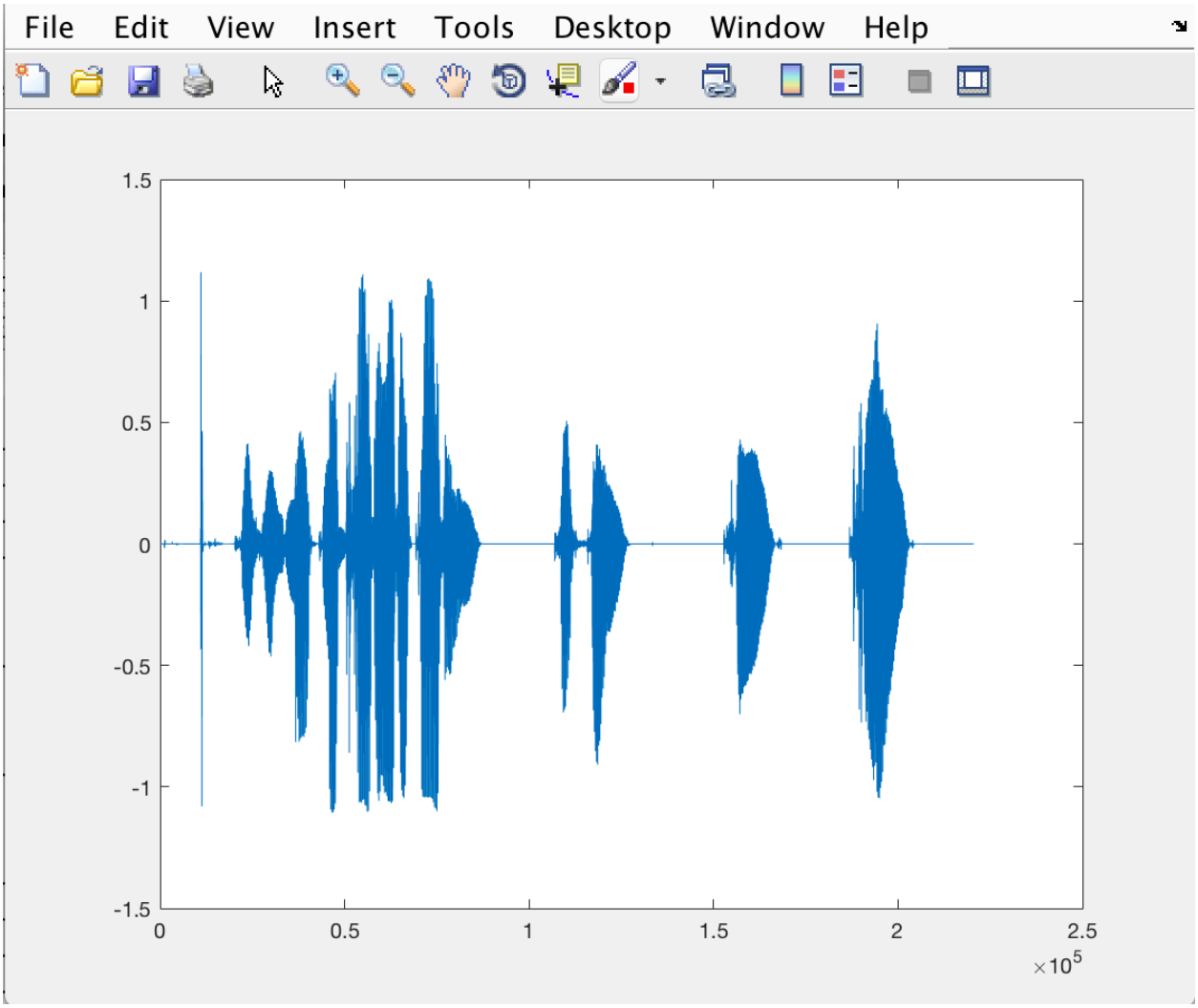
2. **Warm up:**



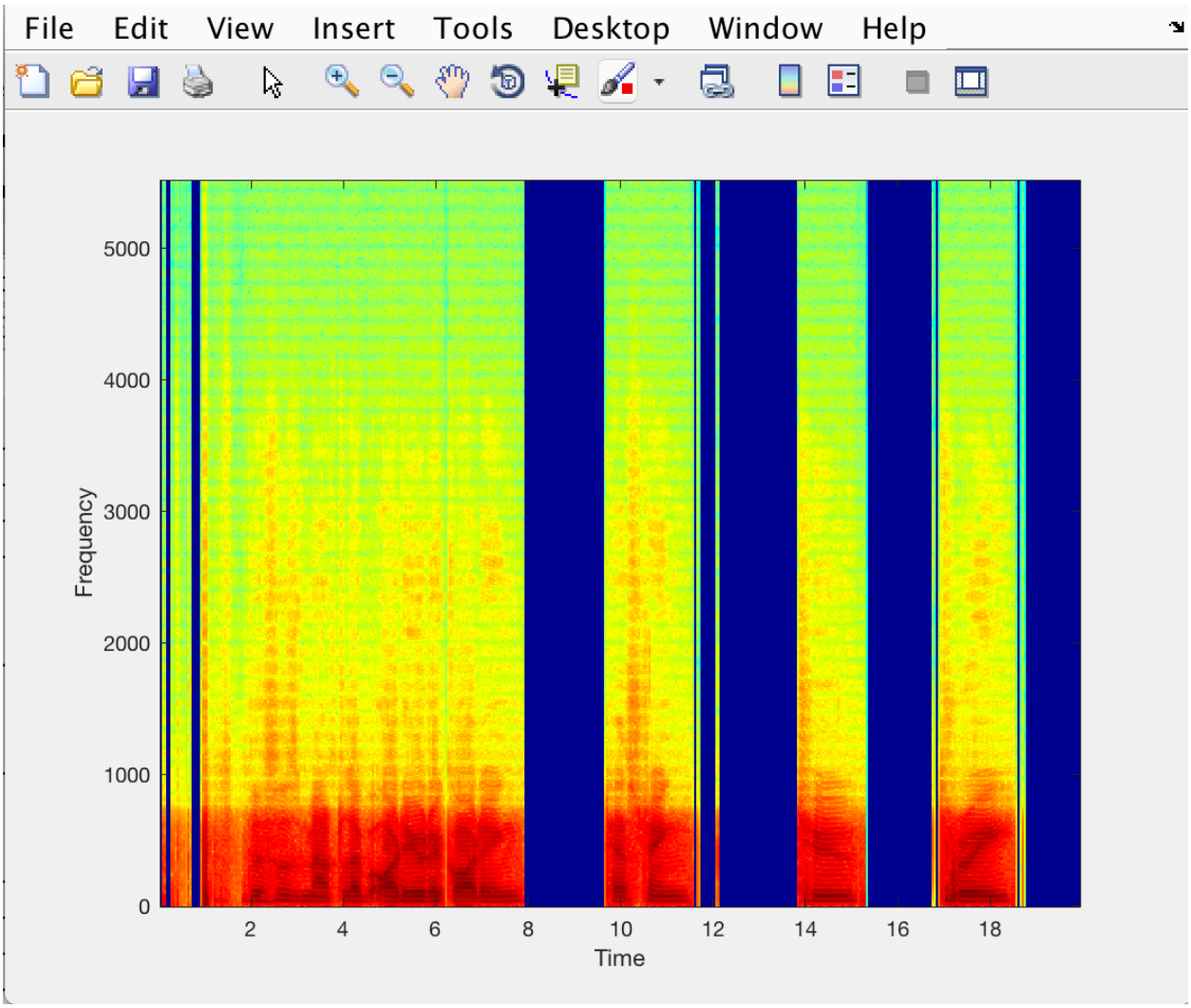
Original Recorded Voice:



Filtered Recorded Voice:

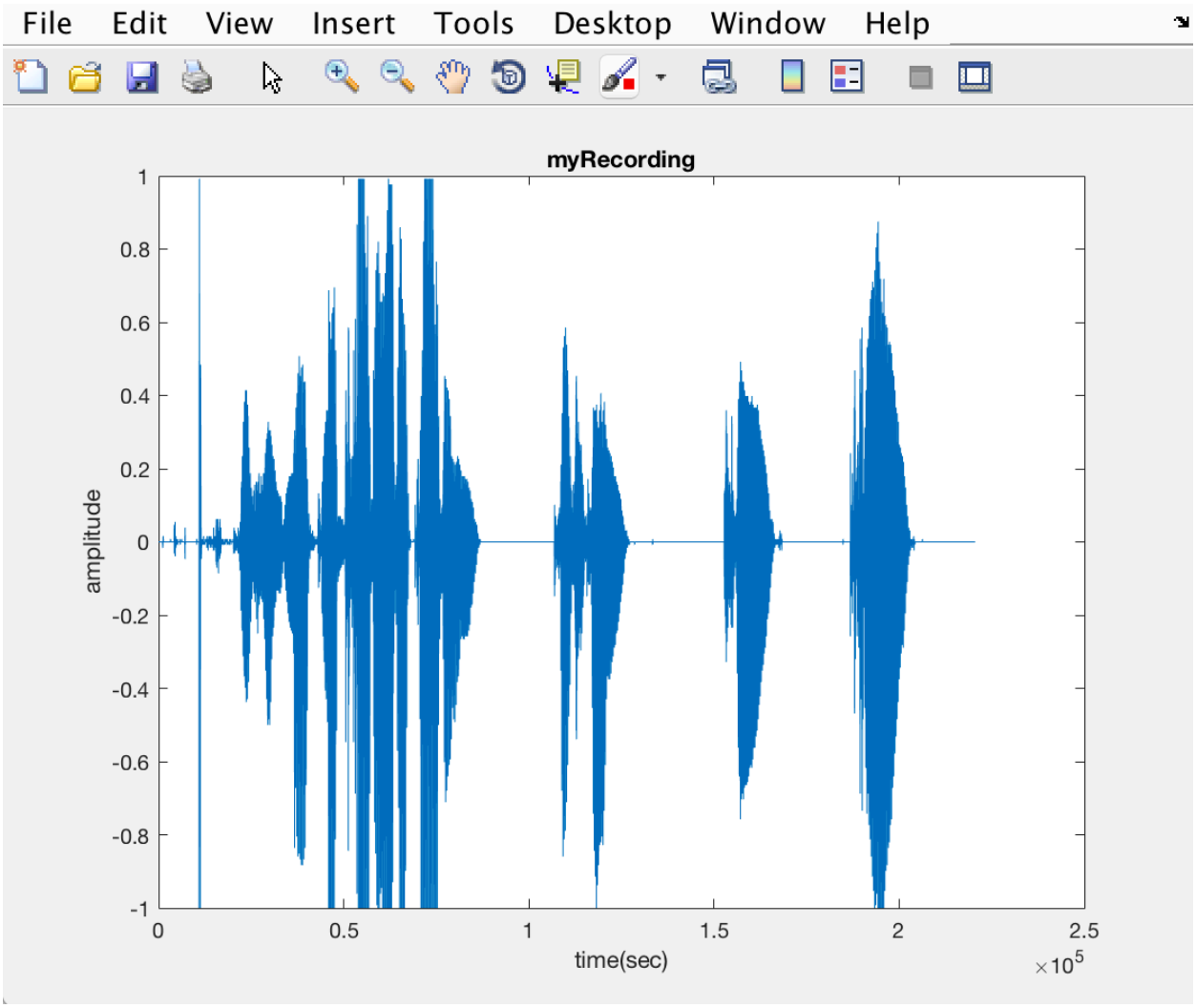


Spectrogram:

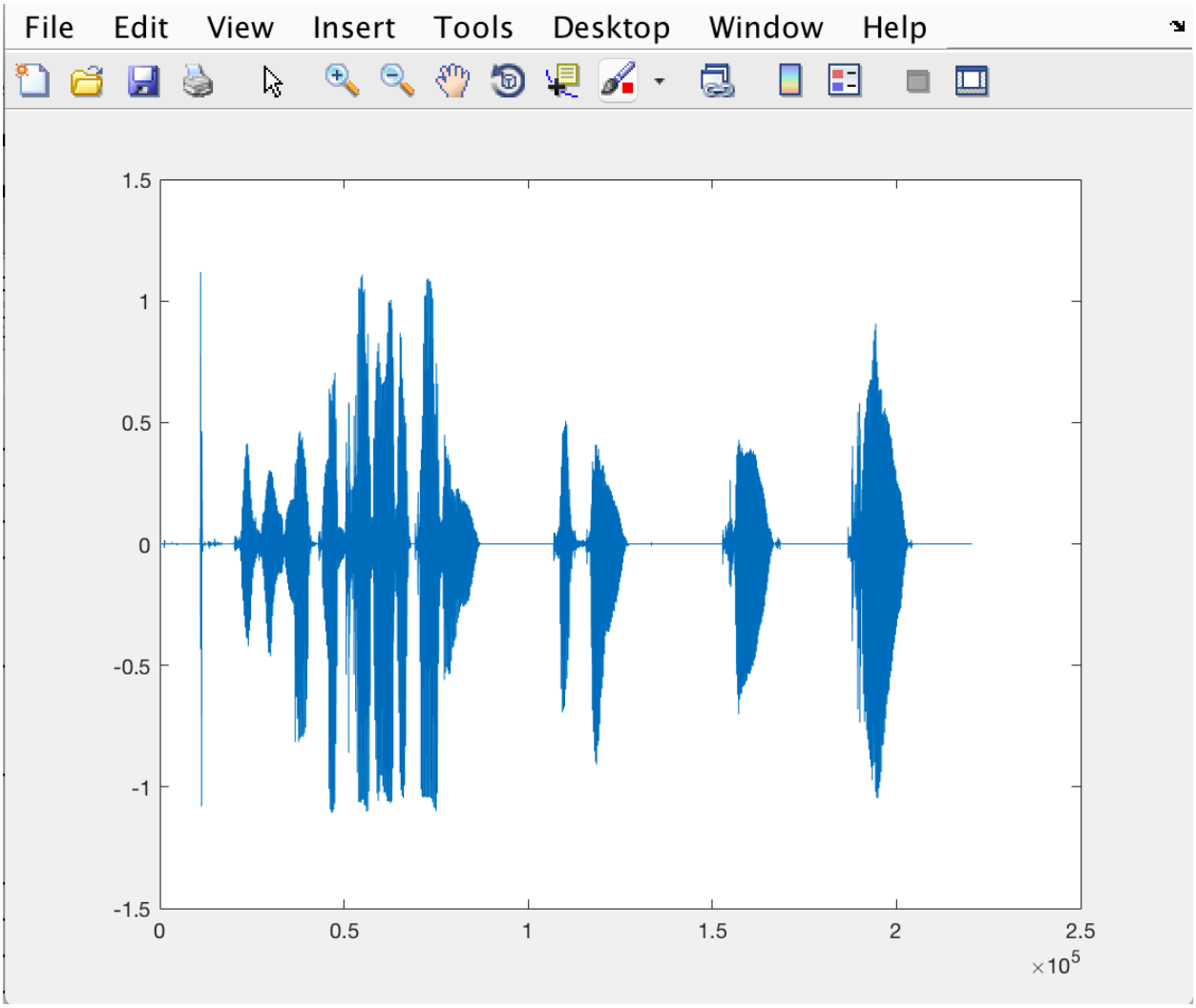


3. **AM Communication System**

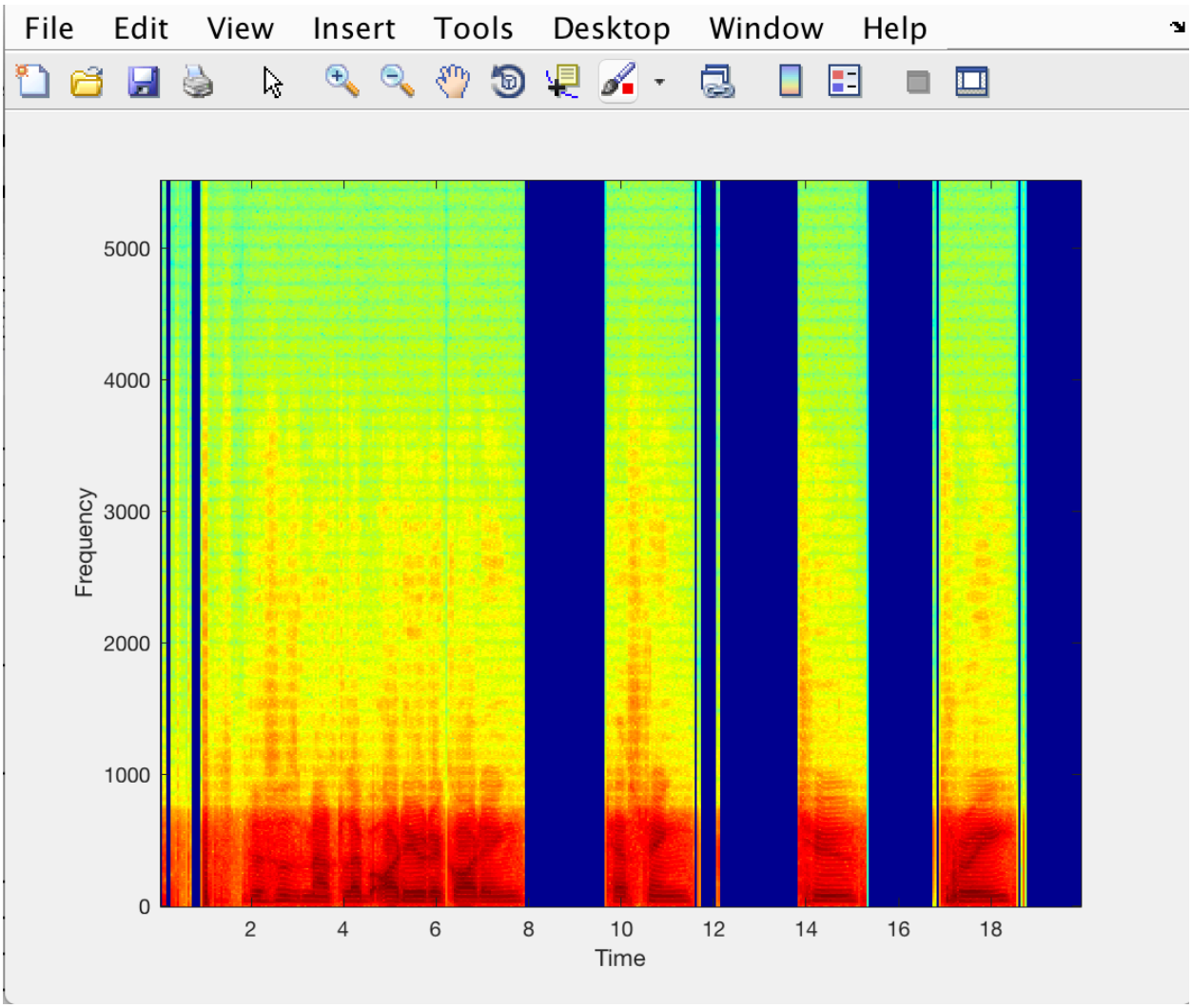
Input Voice Signal:



Filtered Voice:



Spectrogram:



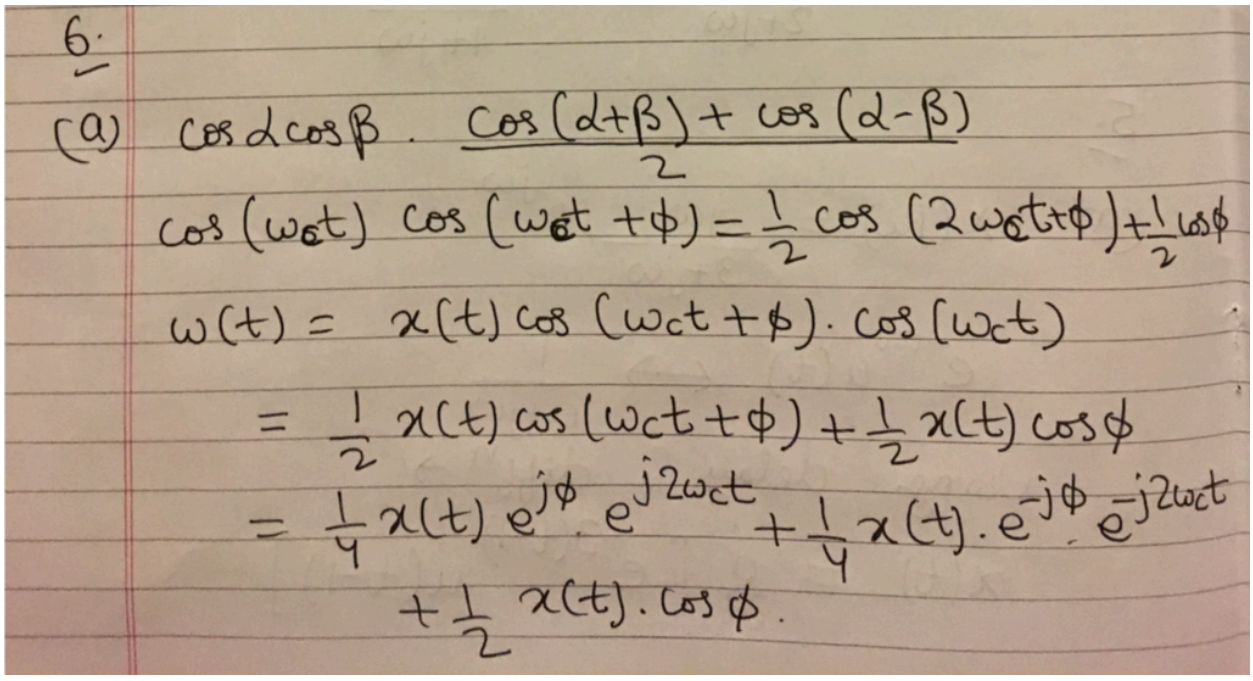
MATLAB Code for AM signal:

```
% Record your voice for 5 seconds.
recObj = audiorecorder(44100,8,1);
disp('Start speaking.')
recordblocking(recObj, 5);
disp('End of Recording.');

% Play back the recording.
play(recObj);

% Store data in double-precision array.
myRecording = getaudiodata(recObj);

% Plot the waveform.
plot(myRecording);
```

```
title('myRecording');
xlabel('time(sec)');
ylabel('amplitude')

% Define the sampling frequency in Hz
fs  = 44100;
len = 1; % length of signals in seconds
t   = (-len/2):1/fs:(len/2); % time index
m   = myRecording
fc = 8000; % carrier frequency
c  = cos(2*pi*fc*t);
% Modulate the signal
u  = m.*c;
am_plot(t,m,c,u,1.1);
% Calculate the spectra
M = am_spectrum(m);
C = am_spectrum(c);
U = am_spectrum(u);
% frequency index for plotting
f = (-fs/2):(1/len):(fs/2);
% plotting them in frequency
am_plot(f,M,C,U,0.1);
```

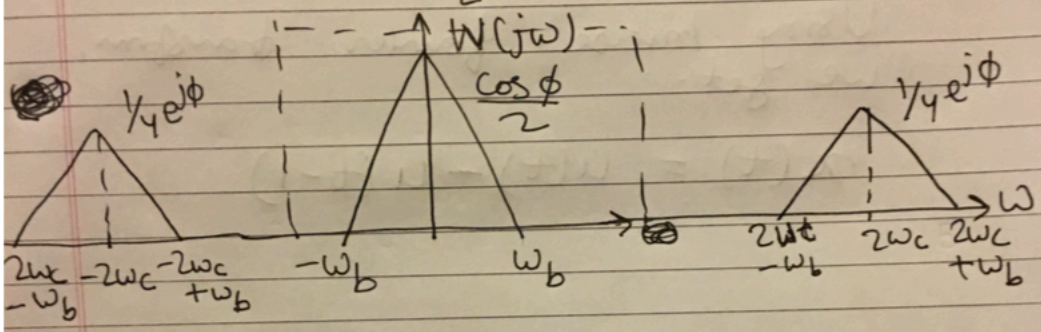
3.1 **Explanation**:

The following is my homework explanation for the derivation of Figure 1.

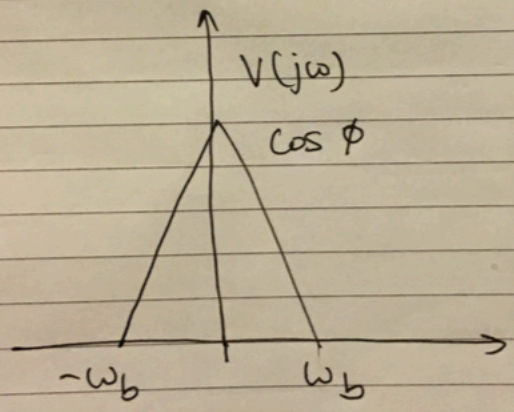


(b) $W(j\omega) = \frac{1}{4} e^{j\phi} X[j(\omega - 2\omega_c)] + \frac{1}{4} e^{-j\phi} X[j(\omega + 2\omega_c)]$

$+ \frac{\cos\phi}{2} X(j\omega)$.



(c)



d) $v(t) = x(t) \cos\phi$.