

**Faculty of Engineering and Technology**

**Electrical and Computer Engineering Department**

***COMMUNICATION SYSTEMS, ENEE339***

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Project #1

Write a python or Matlab script (or simulink) that do the following:

1- read an audio signal from an audio file (.wav format),

2- plot the audio signal in the time domain,

3- determine the Energy of the audio signal,

4- determine and plot the frequency spectrum of the audio signal,

5- determine the X% Energy Bandwidth of the audio signal,

6- apply the audio signal to a LPF with the bandwidth obtained in 5,

7- determine and plot the filtered audio signal in the time domain,

8- write the filtered audio signal to an audio file (.wav format),

9- play the filtered audio signal using any player in windows/Linux

The table below includes some X% Energy Bandwidth values for different audio files. You can use these values to validate your code.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **X%** | **Summer.wav (KHz)** | **Counting.wav**  **(KHz)** | **Athan1.wav**  **(KHz)** | **SunnyDay.wav (KHz)** |
| 95% | 2.345 | 1.556 | 1.5 | 6.5 |
| 90% | 2.008 | 1.089 | 1.461 | 3.81 |
| 85% | 1.777 | 0.721 | 1.445 | 0.266 |
| 80% | 1.593 | 0.613 | 1.206 | 0.088 |
| 75% |  | 0.523 | 1.149 | 0.059 |
| 70% |  | 0.485 | 1.037 | 0.029 |
| 60% |  | 0.411 | 0.892 | 0.016 |
| 50% |  | 0.34 | 0.867 | 0.014 |
| 40% |  | 0.214 | 0.778 | 0.012 |