| LAB5 | SAMPLING RATE CONVERSION<br>points: 8 hours: 2 |
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**Objectives**

1. To understand the concepts of interpolation and decimation.
2. To understand the structure of polyphase filters.

**Exercise 5.1 [1 point]**

Answer the following questions:

a. What is interpolation?
b. What is decimation?
c. Why is filtering needed after the interpolation?
d. Why is filtering needed before the decimation?
e. What is polyphase filtering?

**Exercise 5.2 (CODE) [2 points]**

Write code to do the following:

1. Open WAVE files containing signals *s1*, *s2*, *s3*, *s4*, *sn* from exercise 1.3.
2. Resample each signal at new rate $f_{Ns}$=48kHz using MATLAB functions *interp()* and *decimate()*.
3. Resample each signal at new rate $f_{Ns}$=48kHz using MATLAB function *resample()*.
4. Plot spectrogram of each signal after resampling.

**Exercise 5.3 (CODE) [2 points]**

Write code to do the following:

1. Open WAVE files containing signals *s1*, *s2*, *s3*, *s4*, *sn* from exercise 1.3.
2. Resample each signal at new rate $f_{Ns}$=48kHz using MATLAB function *upfirdn()*. How does this function work?
3. Plot spectrogram of each signal after resampling.

**Exercise 5.4 (CODE) [3 points]**

Write code to do the following:

1. Open WAVE files containing signals *s1*, *s2*, *s3*, *s4*, *sn* from exercise 1.3.
2. Resample each signal at new rate $f_{Ns}$=48kHz using polyphase filters.
3. Plot frequency response of each polyphase filter.