ATHENS - CASE STUDY 3 — EEG Signal Filtering

Analyze biomedical EEG data stored in file EEG_19noise.MAT. Each row of the associated matrix EEG1 represents observation of one channel measured with the sampling frequency of 200 Hz and corrupted by noise of frequency 50 Hz. Solve the problem in the following steps:

- For a selected time period $\langle t1, t2 \rangle$ and a selected channel *chan* evaluate and plot signal spectrum and detect signal frequency components
- Design appropriate FIR stop-band filter of a selected length M and cutoff frequences $f_{c1} = 45\ Hz$ and $f_{c2} = 55\ Hz$ to remove the signal frequency component of 50 Hz and plot its characteristics
- Use associated difference equation to filter out the noise frequency component and plot resulting sequence
- Study the effect of filter quality to result of noise filtering

Use the following MATLAB functions: LOAD, MEAN, FIR1, FREQZ, FILTER, PLOT.

CS3.1	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 5, FILTER LENGTH: M=101;
CS3.2	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 15, FILTER LENGTH: M=101;
CS3.3	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 16, FILTER LENGTH: M=101;
CS3.4	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 6, FILTER LENGTH: M=101;
CS3.5	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 9, FILTER LENGTH: M=101;
CS3.6	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 18, FILTER LENGTH: M=101;
CS3.7	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 5, FILTER LENGTH: M=71;
CS3.8	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 15, FILTER LENGTH: M=71;
CS3.9	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 16, FILTER LENGTH: M=71;
CS3.10	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 6, FILTER LENGTH: M=71;
CS3.11	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 9, FILTER LENGTH: M=71;
CS3.12	TIME PERIOD: t1=41, t2=41.8 [s], CHANNEL: 18, FILTER LENGTH: M=71;