Project for the course
EE-330 Digital Signal Processing
Cleaning EEG data using filters.

Project Statement:

Electroencephalography (EEG) is an essential diagnostic technique that uses tiny electrodes applied to the scalp to record electrical activity in the brain. Yet, to do an effective analysis, EEG signals must be free of numerous forms of noise, including line noise. You will learn how to use Digital Signal Processing (DSP) techniques, with an emphasis on signal filtering and noise reduction.

Objective:

The aim of this project is to give hands-on experience managing, evaluating, and processing EEG data using MATLAB. After cleaning EEG data using a variety of DSP techniques, you will examine it in relation to various brain activity frequency bands.

Tasks:

1. Installation of MATLAB.
2. Data Preparation and Preliminary Analysis.
    a. Detection and removal of line noise.
3. Filter Design and Implementation. *{The cut off frequencies should correspond to delta (0.5 to 4Hz); theta (4 to 7Hz); alpha (8 to 12Hz); sigma (12 to 16Hz) and beta (13 to 30Hz).}*
    a. Notch filter.
    b. High pass filter.
    c. Low pass filter.
    d. Band pass filter.
4. Selection and extraction of 10 selected channels and application of designed filters on the selected channels.
5. Submission Report.
    a. A comprehensive report detailing the installation process, the filtering techniques used, and the outcome of the filtering process.
    b. It should also include the MATLAB code for each filter, and an analysis section with graphical representations of the EEG signals pre- and post-filtering.

Outcomes:

1. Ability to design and implement filters tailored to specific requirements.
2. Enhanced skills in analyzing and interpreting signal data, particularly in the context of signal integrity and noise removal.