Assignment #1
ENGG*6150 Bio-Instrumentation
Winter 2020
Due date March 6, 2020

Problem 1

Briefly define each of the following in biomedical instrumentation terms. A brief paragraph should be sufficient, but avoid copying directly from the internet.

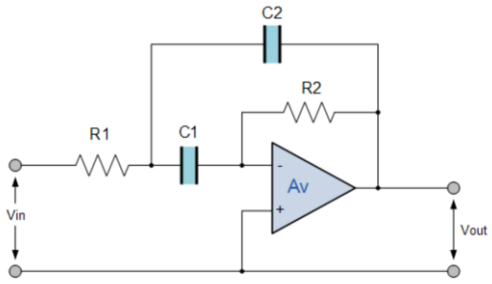
a. measurand
b. direct operational mode
c. invasive and non-invasive
d. generating mode
e. real-time measurements
f. interfering input
g. correlation coefficient
h. zero drift

Problem 2

Using Matlab, design a code that is able to plot the frequency response for an equal-ripple low pass, or high pass or band pass filters based on the given cut-off frequency or bandwidth and passband ripple and order. Start on plotting the low pass filter prototype then scale it to give you the desired filter response.
The code should ask for the type of filter, order, ripple, cut-off frequency in LPF or HPF or bandwidth in case of the bandpass filter (BPF).
The code should be able to generate the values of the circuit elements in the prototype LPF then plot it and scale it to the required type of filters.
Hit: use the provided equations in the slides to calculate the circuit elements and scale those elements to obtain the new circuit elements.
Plot the prototype filter and the desired filter. This code should be able to plot the LPF, HPF and BPF of equal-ripple type.

Problem 3

If the schematic diagram of a second order active Band-pass filter is given as follow:



Where $f_H = \frac{1}{2\pi R_1 C_1}$ and $f_L = \frac{1}{2\pi R_2 C_2}$ and the center frequency is given as $f_r = \frac{1}{2\pi\sqrt{R_1 C_1 R_2 C_2}}$ and the gain is given as $A_v = -\frac{R_2}{2R_1}$

Design a bandpass filter that has a gain of 10dB and an $f_L = 100\ Hz$ and an $f_H = 600Hz$. Plot the response.