Intro

As mentioned in Week 1, the change in the resistance of the gage should be converted into a readable voltage value. And while doing this, the signal should be conditioned so that the full range of the ADC (Analog-to-Digital Converter) on the Seeduino Board can be utilized. This week, you will build a 4-channel amplifier circuit with your group members. Parts will be supplied during your lab hour.

The Circuit

Below is the circuit diagram of a single channel with a quarter bridge. The bridge is balanced by the manual potentiometer and amplified by \( R_2/R_1 = 100 \).

The output of this circuit will be:

\[
V_{\text{out}} = \frac{\varepsilon \cdot GF \cdot V_{\text{in}} \cdot R_2/R_1}{4}
\]

Where \( \varepsilon \) is the strain, \( GF \) is the gage factor, \( V_{\text{in}} \) is the bridge excitation voltage and \( R_1 \) and \( R_2 \) are the gain setting resistors.
Four sets of these amplifiers will be connected to the Seeduino board. The 3.3 Volt will be supplied by the board, and the output signals of the amplifiers will go into the ADC channels 4, 5, 6 and 7 of the Seeduino Board.

When the signals are converted into digital data, the value will be

\[
DV = \frac{\varepsilon \cdot GF \cdot 1024 \cdot R^2 / R_1}{4} = \varepsilon \cdot GF \cdot 256 \cdot \frac{R^2}{R_1}
\]

Hence the strain will be

\[
\varepsilon = \frac{DV}{GF \cdot 256 \cdot \frac{R^2}{R_1}}
\]
Implementation on Breadboard

We will use a quad opamp MCP6234, which has a pinout diagram as below. Note the half circle at the right hand of the drawing. That half circle tells you which side of the package you are looking at. The pin on the left of that half circle is always pin 1.

Since 1 MCP6234 has 4 opamps, we will use one MCP6234c to build 2 channels as below.
Here is a slightly tilted view below,

By the end of week 3, you should have 4 channels set up on your breadboard. The code will be supplied by the TA.