Homework 14 **ENGR 130, FA 22**

Submit your algorithm for Question 2 as a pdf. All code should be submitted as one .m file according to the course assignment submission guide and style guide.

Question 1 (5 points)

Go to the assignment HW14 – MATLAB Grader and complete the assignment that is linked there. Include the code for this problem in your .m file, as well.

Question 2 (25 points)

Before starting the code for the following problem, create an algorithm. If you ask for assistance with this problem, the instructional staff will ask to see the algorithm before helping you.

The file `HW14_StarData.txt` contains (perhaps not surprisingly) data about the 21 closest stars to Earth. It consists of one row of headers followed by four columns of data. The first column is the star's name, second is its distance from Earth in parsecs, third is its spectral type (which is designated as a single letter), and fourth is its apparent magnitude (an indication of how bright the star appears from Earth – the greater the number, the dimmer the star appears.)

Write a MATLAB script to analyze these data to perform the following tasks. You must use at least one meaningful `for` loop and one meaningful `while` loop in your code. Put a clear comment indicating where each of these loops are. You are not required to write any functions, but you are encouraged to do so.

1) How many of the stars in this sample have a spectral type of K? What percentage of the stars sampled is this? Write these results to the command window in a sentence.

2) What is the name of the star in the sample that is the furthest from Earth? What is the name of the star (other than Sol, our Sun) that is the closest? Write these results to the command window in a sentence.

3) Because apparent magnitude (how bright a star appears to be on Earth) is a function of how far away from Earth it is, astronomers often describe stars in terms of their absolute magnitudes (how bright a star would be if observed from a distance of 10 parsecs). Calculate the absolute magnitudes of all the stars in the samples and store them in a vector. The relationship between absolute magnitude (M) and apparent magnitude (m) is

$$M = m - 5\log(d) + 5$$

Where d is the distance from Earth in parsecs. M and m have no units. Note that the command for log (a logarithm in base 10) in MATLAB is `log10`.

4) Ask the user to input the name of a star in the sample and have the code print the name of the star, its distance, apparent magnitude, and absolute magnitude to the command window.

5) Create a new file called `StarCalcs.txt` that contains all the original data, plus an additional column with the absolute magnitudes for the stars. You do not need to include headers for the columns, just the data. **Note:** use `\t` to put a tab in an `fprintf` statement.