Solar Energy Utilization
EML 4930/6417, Spring 2020
MWF Period 3 (9:35 AM – 10:25 AM)
Instructor: Prof. Jonathan Scheffe

Homework #1 – *Getting Familiar with Python*

1) Download Python from https://www.anaconda.com/ ("Anaconda Distribution"). This includes many useful packages but most commonly we will use Spyder and Jupyter, two different ways to evaluate Python code.

2) Open and run "Extraterrestrial Radiation Calculator.py" using Spyder. This can be downloaded from your canvas files. You should see a plot with two curves.

3) Replot the data using the same code but change the plotted lines from red 'r' and blue 'b' in the *plt.plot* lines of code, to other colors of your choice. Here are examples - https://matplotlib.org/3.1.1/tutorials/introductory/pyplot.html

4) We have plotted data every day using the function np.arrange with the line *days=np.arange(1,365,1).* This creates an array from 1 to 365 with a spacing of 1. However, lets imagine we want to see individual data points plotted – it would be difficult to distinguish between them with so many. Therefore, lets plot a point every 10 days by changing the spacing from 1 to 10. Show the results using blue circles for the blue curve by inserting 'bo' in place of 'b'.

Now we want to use the Jupyter Notebook rather than Spyder. You can simply do questions 5, 6 and 7 in a single Jupyter notebook and turn this in.

5) Use Python Jupyter Notebook to the plot the extraterrestrial solar radiation (G_{on}) between March 1st and July 1st. Copy and paste lines from the prior "Extraterrestrial Radiation Calculator.py.py file". At the end of that file are a few lines of code that you can use to determine the day in the year knowing a date. Just uncomment.

6) Using Python Jupyter Notebook, determine the total solar radiation available (in joules, J) on the summer solstice (June 12), winter solstice (December 21st) and spring equinox (March 20th). Use an area of 1 m^2 and time of 8 hours.

7) Using Python Jupyter Notebook, determine the total solar radiation that is visible (in joules, J) on the summer solstice (June 12), winter solstice (December 21st) and spring equinox (March 20th). Use an area of 1 m^2 and time of 8 hours.