ENGR 102 - Lab Assignment #3B

Fall 2019

You are to write four programs as described below. Remember to document your code with comments, and print labels and units when applicable. When these programs are completed, submit all files to eCampus. Remember the appropriate header information.

Program 1

☑ *Prepare and code following the input, calculate, output method. Assign values to variables, and give variables appropriate names for their use.*

Convert the following three calculations from last week's Assignment 2b, Program #1 into three new programs. The updated programs will read data from the user, and output the answer. Use the same variables as before, but instead of assigning values to each within the program, input values from the user.

Please note the following:

a) Your input statements should provide a clear prompt asking the user for information
b) Your output should be descriptive of what the result is.
c) You can make these three separate programs, labeled 1a, 1b, 1c.

Here are the three calculations to convert to interactive programs:

a) The kinetic energy of an object with a given mass and velocity
b) The Reynolds number for a fluid with a given velocity, kinematic viscosity and characteristic linear dimension.
c) The energy radiated per unit surface area (across all wavelengths) for a black body with a given temperature.

Program 2

☑ *Use basic engineering equations and write a Python program to perform the calculations.*
☑ *Use Python modules within your program.*

Red, from Angry Birds, has been launched by a catapult. Write a program that calculates Red's velocity and kinetic energy between two observed points using finite differences. Assume he has a mass of 3kg (this is a constant, but good form is to make it a named variable in the program).

Before coding, think about the variables you will need for your program.

A) Your program should read in:
   a. The (x,y) position (in meters) and time (in seconds) for the first observed point.
   b. The (x,y) position (in meters) and time (in seconds) for the second observed point.

B) The program should then calculate and output Red's velocity and kinetic energy, nicely formatted. The steps for doing this are:
   a. Calculate the velocity in the x-direction and the velocity in the y-direction using the finite differences method:
      $v_x \approx \frac{x_2 - x_1}{t_2 - t_1}$, $v_y \approx \frac{y_2 - y_1}{t_2 - t_1}$
   b. Calculate the overall velocity of Red by combining the x- and y-components. This is essentially finding the magnitude of the hypotenuse of a right triangle. There is a `math.hypot(x,y)` function available; read how to do so, and use this in your program.
   c. Calculate the kinetic energy using Red's mass, and the value you found in part b. for the velocity.