# Python Workshop for Enrichment

**Missouri Science Learning Standard:**
Engineering, Technology, and Application of Science:
ETS! Engineering Design:
9-12.ETS1.B.1 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
9-12.ETS1.B.2 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

**Workshop Student Learning Objectives:**

1) Students will become familiar with the basic Python computational functions and text commands.
2) Students will become familiar with graphing and plotting functions in Python.
3) Students will become familiar with datafile manipulation.
4) Students will be able to use simple programming tools to analyze large datasets, such as the CMS experiment data sources.
5) Students will search for new datasets online and write code to perform analyses.

**AGENDA WEEK 1:**
Day 1

**Introduction to Programming**

**Text/Reference book: http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf**

- What Most Schools Don't Teach

https://www.youtube.com/watch?v=nKIu9yen5nc

- What is Python? (No, not one of Ms. Nolan's pet snakes!)
    - Anybody know why it's called Python?
    - IDE - Integrated Development Environment
    - Print("Hello")

- What is wrong with the following code? Prove your claim by correcting the error and running the code.

  >>> primt 'Hello world!' File "", line 1
  primt 'Hello world!' ^

  SyntaxError: invalid syntax >>>

- What will the following program print out:
  x = 43
  x = x + 1 print(x)

Click the link to open a notebook!
https://colab.research.google.com/drive/1El6YNQAnFqH3yBwOTvR86-tpWrDs6lAp#scrollTo=JyG45Qk3qQLS

**AGENDA WEEK 1:**
Day 2

- Values and types
  - A value is one of the basic things a program works with, like a letter or a number. The values we have seen so far are 1, 2, and “Hello, World!”
  - These values belong to different types: 2 is an integer, and “Hello, World!” is a string, so called because it contains a “string” of letters.
  - You (and the interpreter) can identify strings because they are enclosed in quotation marks.
  - The print statement also works for integers. We use the python command to start the interpreter. python >>> print(4) 4
  - If you are not sure what type a value has, the interpreter can tell you.
    >>> type('Hello, World!')
    >>> type(17)

- The interpreter uses keywords to recognize the structure of the program, and they cannot be used as variable names. Python reserves 35 keywords:
  - and
  - Del
  - from
  - None
  - True
  - as
  - elif
  - global
  - nonlocal
  - try
  - assert
  - else

- if
- not
- while
- break
- except
- import
- or
- with
- class
- False
- in
- pass
- yield
- continue
- finally
- is
- raise
- async
- def
- for
- lambda
- return
- await

**AGENDA WEEK1:**
Day 3

- Statements and Scripts
  - A statement is a unit of code that the Python interpreter can execute
  - A script usually contains a sequence of statements
  - print(1)
    x = 2
    print(x)
    produces the output 1 2

**AGENDA WEEK1:**
Day 4

- Operators and operands
  - Operators are special symbols that represent computations like addition and multiplication. The values the operator is applied to are called operands.

- The operators +, -, *, /, and ** perform addition, subtraction, multiplication, division, and exponentiation, as in the following examples:

  ```
  20+32
   hour-1
  hour*60+minute
   minute/60
   5**2
  (5+9)*(15-7)
  ```

**AGENDA WEEK 2:**
Day 1

Open the following link for our adventure with actual CERN data!

https://colab.research.google.com/github/QuarkNet-HEP/coding-camp/blob/master/muon_mass.ipynb