

Exercise Sheet No. 10 - Programming  
**Energy Informatics**  
Winter 2015-2016

**Exercise 1: (Calculator)**

In this exercise we will explore some basic programming techniques, find out what happens when using operators in certain ways.

- Arithmetic with different typed inputs
- String index out of range
- negative index into string
- `string[x:y]`

**Exercise 2: (Functions)**

- Develop converter functions:
  - Two functions to convert distances between KM and Mile (and back)
  - Two functions to convert temperatures between Centigrade and Fahrenheit (and back)
- Write a function that takes two numbers considered as (x,y) coordinates and computes the distance of this point to the origin.
- Define the function `cube_volume`, which accepts the length of a side of an equilateral cube and computes its volume. If you have time, consider defining `cube_surface`, too.
- Define the function `bool_imply`. It consumes two Boolean values, call them `sunny` and `friday`. The answer of the function is `True` if `sunny` is `False` or `friday` is `True`.
- Define the function `string_insert`, which consumes a string and a number  $i$  and which inserts “\_” at the  $i^{\text{th}}$  position of the string. Assume  $i$  is a number between 0 and the length of the given string (inclusive). How would you deal with the empty string?
- Improve `midnight` by trying to do each operation at most once: define variables that contain values that are needed at least once.
- Python also supports complex numbers. Find out how to extend `midnight` to return complex roots, too.

**Exercise 3: (More functions)**

Develop some other function that requires case distinction to work

- A hydroelectric power plant wants to translate the frequency  $f$  of the AC output into directives for controlling its turbines.
  - $f < 50$  : more water
  - $f \sim 50$  : steady
  - $f > 50$  : decrease water supply
  - $f \ll 50$  or  $f \gg 50$  : disconnect
- Write a function that recognizes a palindrome
- Write a function that reverses a string (or list)