



Lab Work – Python Basics & File Handling

Objective

The objective of this lab is to develop proficiency in working with basic Python data types, displaying output using different formatting methods, handling files through the CSV module, applying built-in functions for counting and condition checking, and navigating directories while filtering files using Python.

TASK 1:

a. Set up Variables

Define variables of different data types (string, integer, float, boolean) and display them.

```
In [16]: resistance = 10
         current = 2.5324
         voltage = resistance * current
         print(voltage)
```

25.323999999999998

b. Old-Style Formatting (%)

Use the % operator to format and print strings.

```
In [17]: print("The resistor value is %d Ω" % resistance) # %d means integer here
         print("The current is %.2f A" % current) # .2f means float upto 2 decimal places
         print("The voltage across the resistor is %.2f V" % voltage)
```

The resistor value is 10 Ω
The current is 2.53 A
The voltage across the resistor is 25.32 V

c) .format() Method

Use .format() to create formatted output.

```
In [18]: print("Resistor: {} Ω, Current: {} A, Voltage: {} V".format(resistance, current, voltage))
         print("Voltage across {} Ω resistor with {} A current is {} V".format(resistance, current, voltage))
```

Resistor: 10 Ω, Current: 2.5324 A, Voltage: 25.323999999999998 V
Voltage across 10 Ω resistor with 2.5324 A current is 25.323999999999998 V

d. f-Strings

Use Python f-strings for clear, readable formatting.

```
In [19]: print(f"Resistor: {resistance} Ω, Current: {current:.2f} A, Voltage: {voltage:.2f} V")
```

Resistor: 10 Ω, Current: 2.53 A, Voltage: 25.32 V

Task 2 – File Handling (numbers.csv)

Read each number from a CSV file

Convert to integer

Add 2 to each number

Print results

Try with different data types and values

```
In [ ]: import csv
with open("numbers.csv", mode="r") as file:
    reader = csv.reader(file)
    print("Processed Results:")
    for row in reader:
        for item in row:
            num = int(item)
            print(num + 2)
```

Processed Results:

12

22

32

42

Task 3 – Counting Whole Numbers (integers.csv)

Read numbers from CSV

Convert all to float

Count how many are whole numbers using:

.is_integer()

sum()

No if-statements allowed

```
In [ ]: import csv
with open("integers.csv", "r") as f:
    numbers = [float(line.strip()) for line in f]
    integers = [num for num in numbers if num.is_integer()]
    count_integers = sum(num.is_integer() for num in numbers)
    print("Total integers in file:", count_integers)
    print("Integers found:", [int(num) for num in integers])
```

Total integers in file: 5

Integers found: [10, 30, 50, 70, 90]

Task 4 - Bit Parity Checker

Take binary signal as integer (e.g., 0b11010110)

Count 1's using .bit_count()

Determine even or odd parity

Print the result clearly

```
In [ ]: signal = 0b11010110
ones_count = signal.bit_count()
parity = "Even Parity" if ones_count % 2 == 0 else "Odd Parity"
print("Binary Signal:", bin(signal))
print("Number of 1s:", ones_count)
print("Parity Type:", parity)
```

Binary Signal: 0b11010110

Number of 1s: 5

Parity Type: Odd Parity

Task 5 – Impedance Using Complex Numbers

Define R, L, C, f

Compute angular frequency $\omega = 2\pi f$

Calculate: Z_r, Z_l, Z_c

Print all impedances

```
In [ ]: import cmath
import math
R = 50 # ohms
L = 0.1 # H
C = 100e-6 # F
f = 60 # Hz
w = 2 * math.pi * f
Z_R = complex(R, 0)
Z_L = complex(0, w * L)
Z_C = complex(0, -1 / (w * C))
print("Resistor Impedance:", Z_R)
print("Inductor Impedance:", Z_L)
print("Capacitor Impedance:", Z_C)
```

Resistor Impedance: (50+0j)

Inductor Impedance: 37.69911184307752j

Capacitor Impedance: -26.525823848649225j

Task 6 – Total Impedance

Add all impedances

Print real part, imaginary part

Print magnitude (abs())

Print phase (cmath.phase())

```
In [ ]: import cmath
Z1=complex(5,10)
Z2=complex(2,5)
Z3=complex(7,9)
Zt=Z1+Z2+Z3
print(Zt)
print(Zt.real)
print(Zt.imag)
magnitude=abs(Zt)
print(magnitude)
phaseAngle=cmath.phase(Zt)
print(phaseAngle)
phase_angle_deg=phaseAngle*180/3.14159
print(phase_angle_deg)
```

```
(14+24j)
14.0
24.0
27.784887978899608
1.042721878368537
59.74361329974206
```

Task 7 – Circuit Current

Voltage source: $V = 120\angle 0^\circ = \text{complex}(120, 0)$

Compute current: $I = V / Z_{\text{total}}$

Print current magnitude and phase

```
In [25]: import cmath
V = complex(120, 0)
Z = complex(30, 40)
I = V / Z
print("Current phasor (I):", I)
print("Magnitude of Current |I| =", abs(I))
print("Phase angle of Current (radians) =", cmath.phase(I))
print("Phase angle of Current (degrees) =", cmath.phase(I) * 180 / 3.14159)
```

```
Current phasor (I): (1.44-1.92j)
Magnitude of Current |I| = 2.4
Phase angle of Current (radians) = -0.9272952180016122
Phase angle of Current (degrees) = -53.13014723127149
```

Task 8- Run and Understand

a. Ohm's Law

```
In [26]: V = 230 # volts
I = 5 # amps
R = V / I # ohms
# Using f-string
print(f"The voltage is {V} V, the current is {I} A, so the resistance is {R:.2f} Ω")
# Using .format()
print("The voltage is {} V, the current is {} A, so the resistance is {:.2f} Ω")
```

The voltage is 230 V, the current is 5 A, so the resistance is 46.00 Ω.
 The voltage is 230 V, the current is 5 A, so the resistance is 46.00 Ω.

b. AC Power

```
In [27]: P = 2000 # watts
V = 220 # volts
I = P / V # amps
print(f"The real power is {P} W at {V} V supply, drawing {I:.2f} A current.")
print("The real power is {} W at {} V supply, drawing {:.2f} A current.".format(P, V, I))
```

The real power is 2000 W at 220 V supply, drawing 9.09 A current.
 The real power is 2000 W at 220 V supply, drawing 9.09 A current.

c. RLC Circuit Impedance

```
In [28]: R = 50
X_L = 30
X_C = 20
Z = complex(R, X_L - X_C)
print(f"Impedance of the circuit is {Z.real} + j{Z.imag} Ω.")
print("Impedance of the circuit is {} + j{} Ω.".format(Z.real, Z.imag))
```

Impedance of the circuit is 50.0 + j10.0 Ω.
 Impedance of the circuit is 50.0 + j10.0 Ω.

d. Efficiency Calculation

```
In [29]: P_out = 950 # watts
P_in = 1000 # watts
eff = (P_out / P_in) * 100
print(f"The machine efficiency is {eff:.1f}% when output is {P_out} W and input is {P_in} W")
print("The machine efficiency is {:.1f}% when output is {} W and input is {} W")
```

The machine efficiency is 95.0% when output is 950 W and input is 1000 W.
 The machine efficiency is 95.0% when output is 950 W and input is 1000 W.

Task 9 – Count PDF Files

Ask user for folder path

List all files in directory

Count files ending with .pdf

Print total count

```
In [ ]: import os  
directory = r"C:\Users\ZUHA\OneDrive\Документи\2nd Semester\reportsCpp\donePDF  
all_files = os.listdir(directory)  
pdf_count = sum(file.lower().endswith(".pdf") for file in all_files)  
print("Total number of PDF files:", pdf_count)
```

Total number of PDF files: 15