Bialystok University of Technology
Faculty of Electrical Engineering
Department of Electrotechnics, Power Electronics
and Electrical Power Engineering

Instruction
for a specialist workshop on

Python Programming 1

Subject code: **CP1S02005E**

(Full-Time Studies)

PYTHON - FILE OPERATIONS, EXCEPTIONS

Instruction Number

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Teaching Materials for Students of the Faculty of Electrical Engineering at BUT.

1. Workstation Description

1.1. Equipment used

A PC-class computer with the Microsoft Windows 10 operating system is used during classes.

1.2. Software

The computers are equipped with the Visual Studio Code 1.86 (or newer) source code editor along with the appropriate extension (Python extension for Visual Studio Code).

2. Exercises Procedure

In the specialist workshop, selected tasks assigned by the instructor must be completed. Different groups may perform different tasks.

1. Write a program that displays a business card on the screen in the following format:

```
**********************************
*            John Smith          *
*    e-mail: j.smith@gmail.com   *
*        tel. 123-456-789        *
**********************************
```

   Save the business card in the same format to a text file named **vcard.txt**.

2. A text file contains temperature measurement results in degrees Celsius. Perform the following operations:

   a) display the contents of the file on the screen;

   b) calculate and display the average temperature recorded in the file;

   c) find and display the maximum and minimum temperature;

   d) create a new text file and save the temperature results converted to Fahrenheit.

3. Write a program that saves an identity matrix of a user-defined size into a text file named **one.txt**.

   Example program output:

   ```
   Enter the size of the matrix: 5
   ```

   Contents of the file **one.txt**:

   ```
   1 0 0 0 0
   0 1 0 0 0
   0 0 1 0 0
   0 0 0 1 0
   0 0 0 0 1
   ```

4. The file **pesel.txt** contains PESEL numbers (one number per line). Write a program that reads this file and checks:

   a) whether each PESEL number is valid;

   b) whether the PESEL number belongs to a male or a female.

   The file **pesel.txt** will be provided by the instructor.

   Example program output:

   ```
   92040251610 – OK – MALE
   92040251611 – INVALID
   92040264401 – OK – FEMALE
   ```

   Comments:

   - the PESEL number is a Polish national identification number used to uniquely identify individuals in Poland,
   - it consists of 11 digits,
   - the number encodes a person's date of birth, gender, and includes a checksum digit for validation,
   - structure of a PESEL number:
     - digits 1-6: date of birth in the format YYMMDD (with a modification for the century),
     - digits 7-10: a unique serial number (the 10th digit indicates gender: even for females, odd for males),
     - digit 11: a checksum digit used to verify the number's validity,

- the method for verifying the control digit comes down to calculating the following sum:

  $d_1 \cdot 1 + d_2 \cdot 3 + d_3 \cdot 7 + d_4 \cdot 9 + d_5 \cdot 1 + d_6 \cdot 3 + d_7 \cdot 7 + d_8 \cdot 9 + d_9 \cdot 1 + d_{10} \cdot 3 + d_{11} \cdot 1$

  if the last digit of the resulting sum is zero, then the PESEL number has a correct control digit; otherwise, the number is invalid.

5. Write a program that, for each line in a text file, calculates and displays:
   a) the total number of characters;
   b) the number of letters;
   c) the number of digits.

   Read the file name from the keyboard. Use appropriate exception handling to protect the program from trying to open a non-existent file.

6. A **CSV** file contains voltage readings from an oscilloscope. Read the contents of the file, then find and display the maximum and minimum voltage values. Read the file name from the keyboard. Use appropriate exception handling to protect the program from trying to open a non-existent file.

7. Read a text file containing personal data (first name, last name, age, height, weight). Read each line of the file and split the data into individual fields. Create a list or other appropriate data structures to store the retrieved information. Display the data on the screen in a readable format.

3. Literature

[1] Ramalho L., Fluent Python: clear, concise, and effective programming. Sebastopol, O'Reilly, 2022.

[2] Matthes E., Python Crash Course, San Francisco, CA, No Starch Press, 2019.

[3] Sweigart A., Automate the Boring Stuff with Python, San Francisco, CA, No Starch Press, 2020.

[4] Lutz M., Learning Python, Sebastopol, CA, O'Reilly Media, 2013.

[5] https://www.python.org/doc/ Python, documentation.

4. Health and Safety Requirements

To begin the practical part of the exercise, it is mandatory to familiarize yourself with the health and safety instructions and fire safety guidelines and to adhere to the rules contained therein.

During laboratory sessions, the following rules must be observed:

- Verify that the devices available at the laboratory workstation are complete and show no signs of physical damage.
- If possible, adjust the workstation conditions to suit individual ergonomic needs. Position the computer monitor to ensure constant and comfortable visibility for all team members.
- Check the correctness of device connections.
- The computer may only be turned on with the instructor’s permission.
- Eating and drinking are prohibited while working with the computer.
- Upon completion of work, log out before leaving the workstation. The operating system may only be shut down upon explicit instruction from the instructor.
- Making any modifications, switching components, or replacing elements of the workstation is strictly prohibited.
- Changing the computer's configuration, including the operating system and software, is not allowed unless it is part of the class program and performed under the instructor’s supervision.
- In the event of a power failure, immediately turn off all devices.
- Any missing equipment or malfunctions must be reported to the instructor.
- It is forbidden to operate, manipulate, or use devices not included in the current exercise.

- In case of electric shock, immediately disconnect the workstation from the power supply. Do not touch the affected person before the power is turned off.