

# The Python Pro programming course

## The 1<sup>st</sup> academic year (2 Terms) of studies

**Full Academics year (31 lessons + graduation lesson)**

| Number of lessons (academic hours) | Topics                                                                                                                                                                       | Learning results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Content                                                                                                                                                                                                                                        |
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| <b>Module 1. Data types</b>        |                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                |
| 4 (8)                              | <ol style="list-style-type: none"><li>1. Introduction to the Python language.</li><li>2. Variables.</li><li>3. Strings.</li><li>4. A workshop on solving problems.</li></ol> | <p>Hard Skills:</p> <ul style="list-style-type: none"><li>- Knows the basic rules of Python syntax and has an understanding of the code formatting standard.</li><li>- Knows the syntax of print(), input(), int(), str() functions.</li><li>- Requests data and prints it out.</li><li>- Applies integer and string data types in problem solving. Switches from one data type to another.</li><li>- Performs actions with strings: sum of strings, repeating a string n times, calculating a string length, getting a string character by number,</li></ul> | <ol style="list-style-type: none"><li>1. More than 100 platform tasks for practicing theoretical and practical skills.</li><li>2. Learning materials for the entire module on the platform.</li><li>3. Participation in a hackathon.</li></ol> |

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|                             |                                                                                                                                                                      | <p>replacing a substring with another substring, dividing a string by separator.</p> <ul style="list-style-type: none"> <li>- Understands how variables' values change when using the assignment operator.</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Adheres to the plan created by the teacher.</li> <li>- When an error occurs, first tries to cope with it independently and then asks for help.</li> <li>- Attempts to analyze their bugs and prevent them in the future.</li> </ul>                                                                              |                                                                                                                                                                                                                                                                          |
| <b>Module 2. Algorithms</b> |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                          |
| 4 (8)                       | <ol style="list-style-type: none"> <li>1. Conditional operator.</li> <li>2. Nested conditional operator.</li> <li>3. Loops.</li> <li>4. Loops. Continued.</li> </ol> | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Reads flowcharts and recognizes algorithmic structures.</li> <li>- Knows the syntax of basic algorithmic constructions: the conditional operator and the loops while and for.</li> <li>- Knows which values belong to the logical data type.</li> <li>- Applies the logical data type when programming logical expressions.</li> <li>- Can list the basic logical operations (logical addition and multiplication) and know the order of their execution.</li> <li>- Solves problems using conditional operators and loops.</li> </ul> | <ol style="list-style-type: none"> <li>1. More than 100 platform tasks for practicing theoretical and practical skills.</li> <li>2. Learning materials for the entire module on the platform.</li> <li>3. "Chatbot" project: creating your own assistant bot.</li> </ol> |

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|                                              |                                                                                                                                                       | <ul style="list-style-type: none"> <li>- Combines conditional statements and loops, including the use of nested constructions.</li> <li>- Tries to choose the best and easiest solution from the available constructions.</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Adheres to the plan created by the teacher.</li> <li>- Understands that only a properly worded question can result in assistance.</li> <li>- Participates in discussions. Attempts to prove their point of view.</li> <li>- Tries to break big tasks down into parts and work on them step by step;</li> </ul> |                                                                                                                                                                                                                                                       |
| <b>Module 3. Methods for organizing code</b> |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                       |
| 4 (8)                                        | <ol style="list-style-type: none"> <li>1. Functions.</li> <li>2. Functions.<br/>Continued</li> <li>3. Modules.</li> <li>4. Team hackathon.</li> </ol> | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Creates functions independently using the def operator.</li> <li>- Return values from functions using the return operator.</li> <li>- Solves problems using functions, including calling one function within another.</li> <li>- Use the debugger to search for errors by controlling variable values.</li> <li>- Understands the difference between the scope of a function and the scope of a program.</li> <li>- Solves problems using global variables.</li> </ul>                                                                              | <ol style="list-style-type: none"> <li>1. More than 70 platform tasks for practicing theoretical and practical skills.</li> <li>2. Learning materials for the entire module on the platform.</li> <li>3. Team project: "Advanced training"</li> </ol> |

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|                                                 |                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>- Uses the built-in modules of the standard Python library.</li> <li>- Creates modules independently and uses them to solve problems.</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Adheres to the plan created by the teacher.</li> <li>- Participates in discussions. Explains their point of view.</li> <li>- Plan the project work with a mind map.</li> </ul>                                                                                                     |                                                                                                                                                                                                                                                                 |
| <b>Module 4. Data structures</b>                |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                 |
| 4 (8)                                           | <ol style="list-style-type: none"> <li>1. Lists and tuples.</li> <li>2. Lists and sets.</li> <li>3. Nested data structures.</li> <li>4. A workshop on solving problems.</li> </ol> | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Knows which data structures are called lists, tuples, dictionaries, and sets.</li> <li>- Knows how to choose a suitable data structure and use it when solving problems.</li> <li>- Uses one data structure inside another (for example, a list inside a dictionary).</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Adheres to the plan created by the teacher.</li> <li>- Participates in discussions. Explains their point of view.</li> </ul> | <ol style="list-style-type: none"> <li>1. More than 70 platform tasks for practicing theoretical and practical skills.</li> <li>2. Learning materials for the entire module on the platform.</li> <li>3. The "Employee Data Storage System" project.</li> </ol> |
| <b>Module 5. Object-oriented programming **</b> |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                 |
| 4 (8)                                           | <ol style="list-style-type: none"> <li>1. Classes.</li> <li>2. Inheritance.</li> </ol>                                                                                             | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Uses their own words to explain what an</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. More than 50 platform tasks for practicing</li> </ol>                                                                                                                                                                 |

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|                             | <ol style="list-style-type: none"> <li>3. The Fast Clicker game. Part 1.</li> <li>4. The Fast Clicker game. Part 2.</li> </ol>                                    | <p>object, property, method, class, and child class are. Can describes the object-class relationship.</p> <ul style="list-style-type: none"> <li>- Solves problems to create their own class using the constructor.</li> <li>- Solves problems to create a child class.</li> <li>- Understands that every object in OOP carries a certain set of data and methods (encapsulation).</li> <li>- Uses and supplements the properties and methods of one class in another class (inheritance).</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Participates in discussions. Explains their point of view.</li> <li>- Attempts to overcome obstacles on their own (e. g. uses tips or checklists).</li> </ul> | <p>theoretical and practical skills.</p> <ol style="list-style-type: none"> <li>2. Learning materials for the entire module on the platform.</li> <li>3. The "Quest: The Knight and Dragon" project: an interactive game on the platform.</li> <li>4. The interactive "Fast Clicker" game on the platform</li> </ol> |
| <b>Module 6. 2D games**</b> |                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                      |
| 6 (12)                      | <ol style="list-style-type: none"> <li>1. Game development in a professional development environment.</li> <li>2. The "Labyrinth" game. Using classes.</li> </ol> | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Uses their own words to explain the meaning of a sprite and a game loop.</li> <li>- Lists the processes that take place in each game loop (event processing, game update, drawing).</li> <li>- Creates different types of sprites (geometric figure, image).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             | <ol style="list-style-type: none"> <li>1. Working in VSC.</li> <li>2. Learning materials for the entire module on the platform.</li> <li>3. 2D "Labirinth" game.</li> <li>4. The executable file for the Labyrinth project.</li> </ol>                                                                               |

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|                                         | <ol style="list-style-type: none"> <li>3. The "Labyrinth" game. Groups of sprites. Handling collisions.</li> <li>4. The "Labyrinth" game. Project revision.</li> <li>5. Project presentation.</li> <li>6. Creating an executable file.</li> </ol> | <ul style="list-style-type: none"> <li>- Handles mouse and keyboard events and in-game events.</li> <li>- Uses OOP tools to create their own classes and descendant classes of ready-made PyGame solutions.</li> <li>- Knows what an extension is and can give examples of them.</li> <li>- Can create executable files in .exe format.</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Plans work on a project using a mind map and a checklist.</li> <li>- Lists the stages of the project.</li> <li>- Works on a project based on the project work algorithm given by the teacher.</li> <li>- Tests their own/other's project according to the teacher's test data.</li> <li>- Presents the project according to their own plan taking into account external constraints (e. g. time).</li> </ul> |                                                                                                                                                                                             |
| <b>Module 7. Desktop applications**</b> |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                             |
| 5 (10)                                  | <ol style="list-style-type: none"> <li>1. Introduction to PyQt5.</li> <li>2. Team development.</li> <li>3. The "Test Roofer" project</li> <li>4. Continuation of</li> </ol>                                                                       | <p>Hard Skills:</p> <ul style="list-style-type: none"> <li>- Knows the purpose of the PyQt library and its functionality.</li> <li>- Lists the main elements of the application.</li> <li>- Understands how to design an application using layouts.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ol style="list-style-type: none"> <li>1. Working in VSC.</li> <li>2. Learning materials for the entire module on the platform.</li> <li>3. "Desktop application" group project.</li> </ol> |

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|                   | <p>work on the project.</p> <p>5. Testing and preparation for project defense.</p> | <ul style="list-style-type: none"> <li>- Uses widgets and layouts to create their own application.</li> <li>- Understands how to develop a user interface using PyQt.</li> <li>- Knows the basics of working in GitHub in a browser and through the terminal.</li> </ul> <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Plans work on a project using a mind map and a checklist.</li> <li>- Works in a team.</li> <li>- Lists the stages of the project.</li> <li>- Can test their own/others' projects.</li> </ul> |                                                                                                                                                                       |
| <b>Graduation</b> |                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                       |
| 1 (2)             | 1. Project defense.                                                                | <p>Soft Skills:</p> <ul style="list-style-type: none"> <li>- Knows how to present their project with other students according to the plan suggested by the teacher.</li> </ul>                                                                                                                                                                                                                                                                                                                                                     | <ol style="list-style-type: none"> <li>1. Certificate of completion of the first study year.</li> <li>2. A souvenir branded with the logo of Algorithmics.</li> </ol> |

**Note:**

\*\* — lessons with two stars are **NOT** conducted for Programming contest students. Those modules mainly for project orientated leaning students.