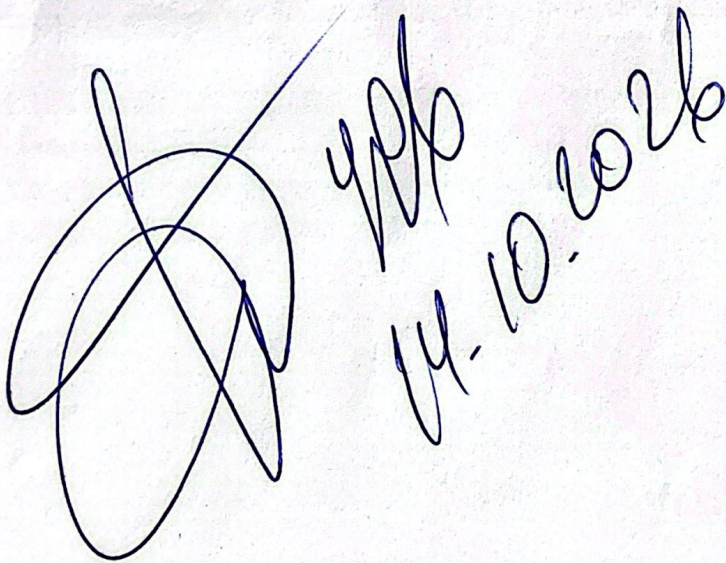


Penza State University
Faculty of Computer Science
Department of Computer Science

EXPLANATORY NOTE

for course design for the course

Flexible Matrix Tool in C



A handwritten signature in blue ink, consisting of a large, stylized 'A' with a diagonal line through it, followed by the initials 'yph' and the date '14.10.2026'.

Completed: Ahmed Osama
student of group: 24VVIA1
Accepted: Fedjunin R.N.

Penza 2026

✓

PENZA STATE UNIVERSITY
FACULTY OF COMPUTER ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING

Head of Department of Technical Education



"14" 10 20 26

Mrs : Karamsheva

Task

Course project assignment for the course
Programming

Project topic: development of a complex structure program using top-down programming.

Initial data (technical requirements) for the design

Scientific calculator is a desktop application built using Python, aimed at executing a variety of complex functions and automating other simple calculations.

Mandatory requirements for the program:

- 1-Use of built-in Python data types: string, integer, Boolean and list.
- 2-Screensaver.
- 3-Graphical operating mode of the video system.
- 4-Menu and toolbar.
- 5-MS Windows as the target operating system.
- 6-PyCharm as the development environment.

- **The Task**

1. **Understood the task.** I read the requirement and listed what the program must do: take two matrices, add them, multiply them, and show the results.
2. **Reviewed the mathematics.** I recalled the rules of matrix addition (same position, same size) and matrix multiplication (row of the first matrix times column of the second), and tried both on a small 2 x 2 example.
3. **Chose a simple design.** I used fixed 2 x 2 matrices (`#define SIZE 2`) and only basic C features (arrays, for loops, `scanf` and `printf`), so the code stays very simple.
4. **Divided the program into functions.** Each function has one job: `inputMatrix` reads, `printMatrix` prints, `addMatrices` adds, `multiplyMatrices` multiplies, and `main` connects them.
5. **Wrote the code step by step.** First the input and print functions, then the addition, then the multiplication, and last the main function that calls everything in order.
6. **Compiled the program.** I compiled it with gcc using the `-Wall` option, which shows warnings, to find and remove mistakes.

The date of the issue of the task is "October 12" 2026

Project defense date" 2026

Teacher Fediunin R.N.

Received the task on October 12, 2026 Student

Ahmed Osama



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6. Conclusion

This project is a menu-driven C program that adds matrices, multiplies matrices and finds the transpose of a matrix. The user chooses the size of each matrix (up to 5 x 5), and the program checks the sizes before it calculates. This is important for multiplication, because it is only possible when the number of columns of the first matrix equals the number of rows of the second one. When the sizes do not match, the program prints a clear error message and returns to the menu.

The test run gave correct results. A 2 x 3 matrix was added to another 2 x 3 matrix, a 2 x 3 matrix was multiplied by a 3 x 2 matrix to give [58 64; 139 154], and a 2 x 3 matrix was transposed into a 3 x 2 matrix. All results match the hand calculations. The project shows the use of two-dimensional arrays, nested for loops, passing values by address, and a do-while loop for repeating a menu. It can be improved by adding subtraction, by using dynamic memory for bigger matrices, or by reading the matrices from a file.

7. References and Sources

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