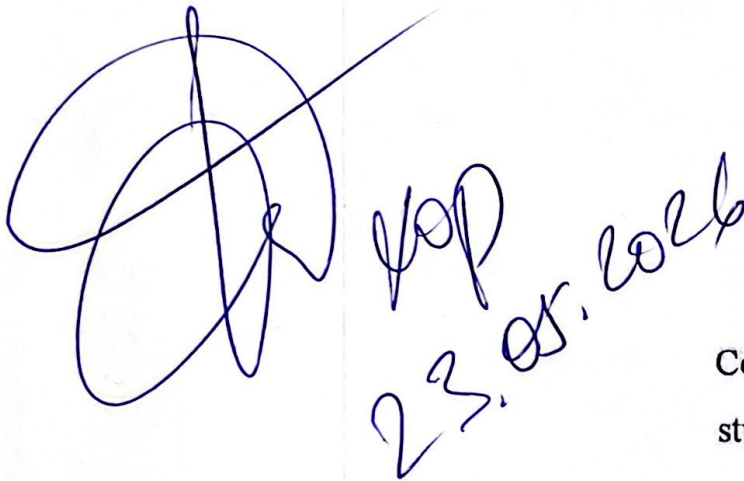


Penza State University
Faculty of Computer Science
Department of Computer Science

EXPLANATORY NOTE

for course design for the course
«Logic and fundamentals of algorithmization in engineering problems»
on the topic
Complex program structure «Calculator Using Stacks»



Handwritten signature and date: 23.05.2026

Completed: Khalid Alakbari
student of group: 24VVIA1
Accepted: Fedjunin R.N.

Penza 2026

Penza State University
Faculty of Computer Engineering
Department of Computer Engineering

"APPROVE"



Head of the Department of Computer Engineering

_____ M.A. Mitrokhin

«__» _____ 2025 y.

EXERCISE

for course design for the course

Programming

Student _____ Group 24VVIa1

Project topic: *Development of a program using algorithms and data structures*

Initial data (technical requirements) for design

Application name: Calculator using stack

Task: The program must implement 10 basic arithmetic and logical operations. The program works with float and integer data. Data width: 16 and 32 bits. Data and operations must be processed using a stack. The number of stacks is specified and justified by the developer.

Mandatory requirements for the program:

1. Multimodularity.
2. Using complex data types of structures, files.
3. The video system operating mode is a text.
4. Input device: keyboard, mouse.
5. The user interface should be built on the basis of menus.
6. Availability of a screensaver.
7. MS Windows operating system.
8. C programming language.
9. Software development environment - Microsoft Visual Studio.

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Scope of work for the course

1. Calculation part

Program development.

2. Graphic part

Data diagram, system resource diagram, system operation diagram, program hierarchical structure, program interaction diagram.

3. Experimental part

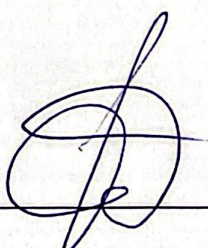
Debugging the program.

Project completion time by section

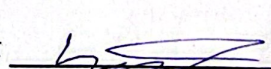
According to schedule

The assignment issuance date is _____, _____.

Project defense date "____" _____.

Manager  Fedjunin R.N.

Received the task "____" _____

Student  (Full name) Khaled Ahmed Omar

✓

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Introduction

The objective of this course project is to design and implement a console-based calculator program using the C programming language.

The calculator evaluates mathematical expressions entered in infix notation. To correctly process operator precedence and parentheses, the program uses stack data structures and applies a modified Shunting Yard algorithm to convert expressions into postfix form before evaluation.

This project strengthens practical programming skills such as:

- Working with dynamic data structures;
- Implementing algorithms;
- Parsing mathematical expressions;
- Modular program organization;
- Testing and debugging C applications.

Conclusion

During the completion of this coursework, important programming skills were developed and strengthened, including:

- Implementation of stack data structures;
- Understanding of the Shunting Yard algorithm;
- Expression parsing techniques;
- Modular programming in C;
- Debugging and testing of console applications.

As a result, a fully functional calculator program was created that evaluates mathematical expressions accurately.

Future improvements may include:

- Adding a graphical user interface;
- Extending operator support;
- Implementing enhanced error handling;
- Supporting additional expression formats.

✓

List of sources used

1. W3Schools – C Programming Language Reference : website. –
URL: <https://www.w3schools.com/c/> (date of access: 12.05.2026). – Text :
electronic.
2. GeeksforGeeks – Expression Evaluation Using Stack : website. –
URL: <https://www.geeksforgeeks.org/expression-evaluation-using-stack/> (date
of access: 12.05.2026). – Text : electronic.
3. Programiz – Data Structures Using C : website. –
URL: <https://www.programiz.com/dsa> (date of access: 12.05.2026). – Text :
electronic.