



# **INTRODUCTION TO SOFTWARE ENGINEERING**

## **ASSIGNMENT # 2**

**PROJECT NAME:**

**Legacy-calc-2009**

**Names:** Iffa Usman, Zehra Ahmad

**Roll Numbers:** 24P-6700, 24P-3045

**Class:** SE-3A

**Github links:**

Iffa: <https://github.com/Iffa-Usman/legacy-calc-2009/tree/dev>

Zehra: <https://github.com/Zehra0624/legacy-calc-2009/tree/dev>

## **PROJECT OVERVIEW:**

### **Objective :**

The main goal of this project was to fix issues and improve an already existing legacy loan calculator to make it more accurate, user-friendly, and reliable for everyday use.

### **Key Features & Improvements:**

- **Bug Fixes:** Added input validation to negate any invalid amounts, prevented integer overflow using long double, step by step safer and accurate calculation and removed hardcoded values by reading configuration from a file (config.txt).
- **Refactoring:** Organized main.cpp into multiple file i.e. Loan.cpp and Loan.h .
- **Unit Tests:** Normal EMI calculation, Invalid input handling, large values should not overflow
- **Documentation:** Doxygen comments were added to all functions, and HTML documentation was generated and included in the repo, making the code easy to understand and maintain.

## Code Snippets of Bug Fixes:

```
//Big Fix 1: Validating Inputs to prevent negative or invalid loan amounts
do {
    cout << "Enter the loan amount: ";
    cin >> loan_amount;
    if(loan_amount <= 0) {
        cout << "Error: Loan amount must be positive!" << endl;
    }
} while(loan_amount <= 0);

do {
    cout << "Enter the interest rate: ";
    cin >> interest_rate;
    if(interest_rate < 0) {
        cout << "Error: Interest rate cannot be negative!" << endl;
    }
} while(interest_rate < 0);

do {
    cout << "The number of years: ";
    cin >> number_of_years;
    if(number_of_years <= 0) {
        cout << "Error: Tenure must be at least 1 year!" << endl;
    }
} while(number_of_years <= 0);
```

```
int main() {
    double loan_amount, interest_rate, number_of_years;
    long double total_amount, monthly_amount; //Bug Fix 2: Safer calculations using long double
```

```
//Bug Fix 3: Calculations done step by step to prevent overflow
long double principal = loan_amount;
long double interest = principal * (interest_rate / 100.0L) * number_of_years;
total_amount = principal * number_of_years + interest;
monthly_amount = total_amount / (number_of_years * 12);
```

```
// Bug Fix 4: Load default values from config.txt
// The file format is simple: 3 numbers in order: loan_amount interest_rate number_of_years
long double defLoan = 0, defRate = 0, defYears = 0;
ifstream config("config.txt");
if (config) {
    config >> defLoan >> defRate >> defYears;
    config.close();
}
```

## Code Snippets of Refactoring (Loan.h, Loan.cpp):

```
Desktop > legacy-calc-2009 > src > C Loan.h > ...
1  /**
2  * @class Loan
3  * @brief Stores loan details and calculates total, interest and monthly payment.
4  */
5  class Loan {
6  public:
7      long double loan_amount;
8      long double interest_rate;
9      long double number_of_years;
10
11     /**
12     * @brief Constructor to initialize loan values.
13     * @param la Loan amount
14     * @param ir Interest rate
15     * @param ny Number of years
16     */
17     Loan(long double la = 0, long double ir = 0, long double ny = 0);
18
19     /**
20     * @brief Calculates total amount payable (principal + interest)
21     * @return long double Total amount to pay
22     */
23     long double calculateTotalAmount() const;
24
25     /**
26     * @brief Calculates monthly payment (EMI)
27     * @return long double Monthly installment
28     */
29     long double calculateMonthlyPayment() const;
30
31     /**
32     * @brief Calculates total interest payable
33     * @return long double Total interest
34     */
35     long double calculateInterest() const;
36 };
```

```
Desktop > legacy-calc-2009 > src > C Loan.cpp > calculateTotalAmount() const
1  #include "Loan.h"
2
3  // Constructor
4  Loan::Loan(long double la, long double ir, long double ny) {
5      loan_amount = la;
6      interest_rate = ir;
7      number_of_years = ny;
8  }
9
10 // Total amount to be paid (principal + interest)
11 long double Loan::calculateTotalAmount() const {
12     long double interest = loan_amount * (interest_rate / 100.0L) * number_of_years;
13     return loan_amount + interest;
14 }
15
16 // Total interest
17 long double Loan::calculateInterest() const {
18     long double interest = loan_amount * (interest_rate / 100.0L) * number_of_years;
19     return interest;
20 }
21
22 // Monthly amount
23 long double Loan::calculateMonthlyPayment() const {
24     long double total = calculateTotalAmount();
25     return total / (number_of_years * 12);
26 }
27
```

## Screenshot of test output:

```
iffausman@Iffas-MacBook-Pro legacy-calc-2009 % g++ -std=c++11 src/Loan.cpp test/test_emi.cpp -o test_emi
iffausman@Iffas-MacBook-Pro legacy-calc-2009 % ./test_emi
TEST 1 PASSED: Normal calculation
TEST 2 PASSED: Zero years handled by validation in main.cpp
TEST 3 PASSED: Large values handled
iffausman@Iffas-MacBook-Pro legacy-calc-2009 %
```

## Git commit history:

## Zehra's Commits:

Commits

dev

All users

All time

Commits on Nov 25, 2025

Updating README

ZehraG24 committed 1 hour ago

588f3b6

Adding Doxygen html document

ZehraG24 committed 1 hour ago

8e3da80

Updating test\_emi.cpp

ZehraG24 committed 1 hour ago

ca06ac7

Updating Loan.h

ZehraG24 committed 1 hour ago

1f21c6

Updating Loan.cpp

ZehraG24 committed 1 hour ago

b8ba0f0

Unit test: test\_emi.cpp applied

ZehraG24 committed 2 hours ago

6e5826d

Adding config.txt

ZehraG24 committed 18 hours ago

336a5a2

Refactoring: Loan.h

ZehraG24 committed 18 hours ago

3aca25b

Refactoring: Loan.cpp

ZehraG24 committed 18 hours ago

53a0ae2

Refactoring: main.cp

ZehraG24 committed 18 hours ago

7085dae

Bug Fix 4: Load default values from config.txt

ZehraG24 committed 19 hours ago

8a236f5

Commits on Nov 24, 2025

Bug Fix 2+3: using long double and step by step calculation to prevent overflow

ZehraG24 committed 20 hours ago

b55c8fe

Bug Fix 1: Validating inputs

ZehraG24 committed 20 hours ago

b52da89

Updated README

ZehraG24 committed yesterday

e199641

Added src folder with main.cpp gist version

ZehraG24 committed yesterday

9544557

Updated README with build and run instructions

ZehraG24 committed yesterday























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





Add .gitignore to ignore build and generate files

ZehraG24 committed yesterday

9963a6a

## Iffa's Commits:

Commits on Nov 24, 2025		
Adding config.txt	Iffa-Usman authored and Iffa-Usman committed yesterday	0a80172  
Refactoring: Loan.h	Iffa-Usman authored and Iffa-Usman committed yesterday	75fb680  
Refactoring: Loan.cpp	Iffa-Usman authored and Iffa-Usman committed yesterday	7878543  
Refactoring: main.cpp	Iffa-Usman authored and Iffa-Usman committed yesterday	a9de2f4  
Bug Fix 4: Load default values from config.txt	Iffa-Usman authored and Iffa-Usman committed yesterday	ceea09  
Bug Fix 2+3: Using long double and step by step calculation to prevent overflow	Iffa-Usman authored and Iffa-Usman committed yesterday	fee36ca  
Bug fix 1: Validating Inputs	Iffa-Usman authored and Iffa-Usman committed yesterday	81c7bc6  
Updated README	Iffa-Usman authored and Iffa-Usman committed yesterday	300e55c  
Added src folder with main.cpp gist version	Iffa-Usman authored and Iffa-Usman committed yesterday	54dad78  
Updated README with build and run instructions	Iffa Usman authored and Iffa Usman committed yesterday	1b491cc  
Add .gitignore to ignore build and generate files	Iffa Usman authored and Iffa Usman committed yesterday	bd3693d  

Commits on Nov 25, 2025		
adding docs	Iffa-Usman authored and Iffa-Usman committed 44 minutes ago	9f2757a  
updated .igitignore	Iffa-Usman authored and Iffa-Usman committed 45 minutes ago	edd9353  
updating README	Iffa-Usman authored and Iffa-Usman committed 1 hour ago	7478fd1  
updating test_emi.cpp	Iffa-Usman authored and Iffa-Usman committed 1 hour ago	912694f  
updating Loan.h	Iffa-Usman authored and Iffa-Usman committed 1 hour ago	3e209f6  
Adding doxygen html document	Iffa-Usman authored and Iffa-Usman committed 7 hours ago	271b68b  
unit tests : test_emi.cpp applied	Iffa-Usman authored and Iffa-Usman committed 9 hours ago	003bafc 