

# **Software Requirement Specifications**

## **Project: Scientific Calculator**

**Group 8:**

<b>Pankaj Gangwar -</b>	<b>14I320002</b>
<b>Siddharth Kshatriya -</b>	<b>145060002</b>
<b>Amritesh Sharma -</b>	<b>14D260012</b>
<b>Harit Kumar -</b>	<b>14B030022</b>

# Acknowledgements

We would like to express our deep gratitude to **Professor Dr.D.B. Phatak** and **Professor S. Chakraborty** for their invaluable teachings of the language, without which the interest and enthusiasm of our team wouldn't have been up to the mark.

We would also like to express our very great appreciation to our Group Teaching Assistant **Mr. Vaibhav Tripathi** for his valuable and constructive suggestions during the planning and development of this project. His willingness to give his time so generously has been very much appreciated.

We would also like to extend our thanks to **Ms. Firuza Aibara** for her kind assistance and guidance.

**Group 8, Slot 6B**  
**Pankaj Gangwar**  
**Siddharth Kshatriya**  
**Amritesh Sharma**  
**Harit Kumar**

# Scientific Calculator

**The Purpose** of this document is to present a detailed description about our project. It will explain features, functionality and the constraints of the system.

Our Project aims to create an advanced Scientific Calculator Software. This software will feature functions that will allow the user to calculate some of the essential mathematical computations apart from the basic functionalities that a normal scientific calculator provides. Above all, we hope that the software provides the user a convenient way for operating the software.

## Product Features:

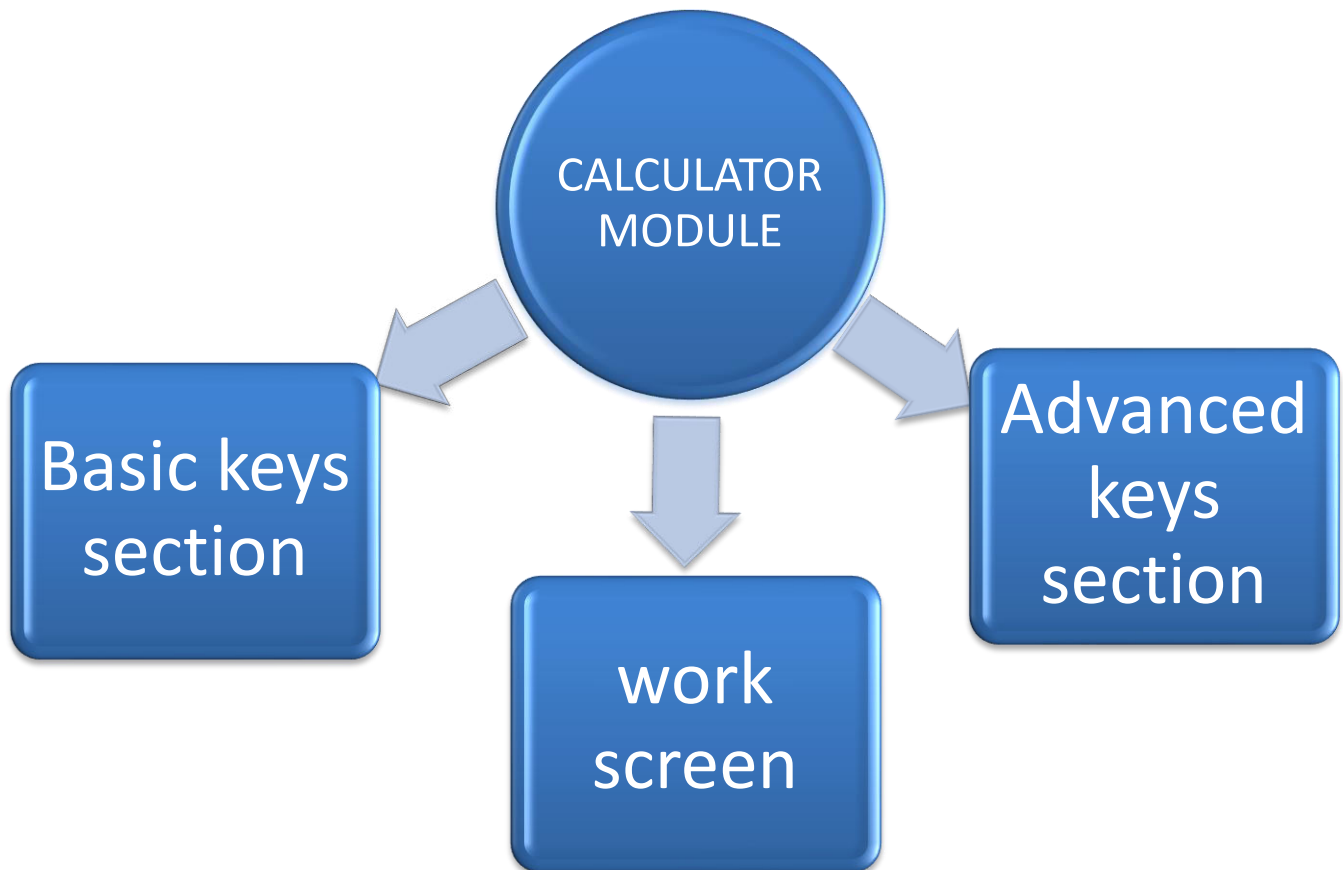
We intend to incorporate and code the following functions in our software along with the basic calculator functions, as listed below:

1. **Logarithmic functions, using both base 10 and base e**
2. **Trigonometric functions: sin, cos, tan and inverse trigonometric functions.**
3. **Exponential functions,  $n^{\text{th}}$  Root and  $n^{\text{th}}$  Power**
4. **Permutations and Combinations**
4. **Quick access to constants such as pi and e**
5. **Area calculations**
6. **Calculus- Integrator and differentiator  
Differential equations**
7. **Hexadecimal, Binary, and Octal conversions.**
8. **Basic Boolean algebra**
9. **Complex numbers**
10. **Statistics and probability calculations**
11. **Equation solving: linear  $n$  variables polynomial – quadratic and cubic**
12. **Physical constants**
13. **Matrices computations-addition, subtraction, multiplication, inverse**
14. **Determinants**
15. **Unit conversion**

**Operating Environment:** This software can run on Windows and Ubuntu.

**Design and Implementation:** This Calculator application is planned to be displayed in **3 sections:**

1. Screen (or work screen)
2. Basic Key section
3. Advanced function key section



*Schematic representation of the calculator module*

### **Screen:**

It will be like any other screen which will display the input and output messages to user. The dimensions of the screen will be of moderate size such that the large space occupying functions such as the Determinants and Matrices can be best fitted in the screen.

## Basic key section:

This section will include all the basic keys listed below:

- Numeric keys: 0 to 9
- Decimal Point: '.'
- Operators: +, -, /, \*
- Trigonometric Functions : Sin, Cos, Tan,  $\sin^{-1}$ ,  $\tan^{-1}$ ,  $\cot^{-1}$
- ! (factorial)
- $\sqrt{x}$ ,  $x^2$ ,  $x^{-1}$
- $10^x$ ,  $e^x$ ,
- $r\sqrt{x}$
- log
- ln
- $\pi$
- |x| (modulus)
- Del, AC
- =, Ans
- Check

## Advanced Key section:

This key section features the advanced keys. When any button is clicked, the calculators will ask the user the operation which he wants to perform.

- **Matrices**
  - Addition
  - Subtraction
  - Multiplication
  - Inverse
- **Determinants**
- **Vectors**
  - Addition
  - Subtraction
  - Scalar product
  - Vector product (upto 3 dimensions)
  - Dependency-independency
  - Angle between two vectors
- **Equation solver**
  - linear (n-variables)
  - polynomials: Quadratic & cubic
- **Calculus**
  - Definite Integration and Differential Equations
- **Statistics**
  - Median
  - Average
  - Standard Deviation
- **Permutations & Combinations:**  ${}^nC_r$  and  ${}^nP_r$

## System Response Sequences:

1. The user can directly enter any algebraic expression from the basic key section. The computer will take the input as a string.
2. The string will be taken as infix and then converted to a postfix string which obeys the BODMAS and then it is evaluated and the output is flashed on the screen.
3. In a similar manner as algebraic expression, the user can enter any expression involving the trigonometric or square root or any other basic key function as an input directly and the calculator will give the result by using the infix to postfix algorithm and evaluation of the respective function involved in the expression.
4. If the user desires to perform any advanced functions, he can select it from the advance key section. For example, the user wants to add two matrices; he has to click on the '*Matrices*' button. The computer will display various operations which it can perform for matrices as numbered. The user is required to select the operation by entering the number displayed against the operation. If he selects addition, the calculator will ask the order .i.e. the value of  $i*j$ .

## Platform:

The main code for the program will be written in **C++ language** using **Code::Blocks/Qt creator**.

Our team intends to present a good graphical outlook for the software. For Graphics we will use "Qt" - a cross platform application framework that is widely used for developing application software with a graphical user interface (GUI).

We hope to implement the graphics successfully if the time permits.

## References:

1. CS 101 Tutorials by Dr. D.B. Phatak and Professor S. Chakraborty, IIT BOMBAY  
<http://www.cse.iitb.ac.in/~cs101/lectures-slides>
2. For Algorithm of Calculus: Introductory methods of Numerical Analysis by S.S Sastry  
PUBLISHER: Prentice Hall of India
3. An Introduction to Programming through C++, McGraw Hill Education, 2014, by Prof. Abhiram Ranade
4. Buckys C++ Tutorials- <https://www.youtube.com/channel/UCJbPGzawDH1njbqV-D5HqKw>

-----  
-----