**Department of Electrical Engineering and   
Computer Science**

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**EE-383:** **Instrumentation and Measurements**

Lab 2: LabVIEW Programming Environment, Structures and Basic Operations

Lab Instructor: Mr. Ali

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| --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Reg. No** | **Conduct of**  **Experiment** | **Analysis of data in Lab Report** | **Modern Tool Usage** | **Ethics**  **and**  **Safety** | **Individual and Teamwork** |
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**Table of Contents**

[2 Table of Figures 3](#_Toc115211004)

[3 LabVIEW Programming Environment 4](#_Toc115211005)

[3.1 Objectives 4](#_Toc115211006)

[3.2 Equipment 4](#_Toc115211007)

[3.3 Introduction 4](#_Toc115211008)

[3.4 Lab Instructions 4](#_Toc115211009)

[4 Lab Tasks 5](#_Toc115211010)

[4.1 Converting to 5](#_Toc115211011)

[4.2 Calculating the slope of a line 5](#_Toc115211012)

[4.3 Calculator VI 6](#_Toc115211013)

[4.4 Square Root VI 7](#_Toc115211014)

[5 Questions 7](#_Toc115211015)

[6 Conclusion 8](#_Toc115211016)

# Table of Figures

[Figure 4.1‑a Block Diagram 5](#_Toc115211017)

[Figure 4.1‑b Front Panel 5](#_Toc115211018)

[Figure 4.2‑a Block Diagram 5](#_Toc115211019)

[Figure 4.2‑b Front Panel 5](#_Toc115211020)

[Figure 4.3‑a Block Diagram 6](#_Toc115211021)

[Figure 4.3‑b Operation Menu 6](#_Toc115211022)

[Figure 4.3‑c Front Panel 6](#_Toc115211023)

[Figure 4.4‑a Block Diagram - True 7](#_Toc115211024)

[Figure 4.4‑b Block Diagram – False 7](#_Toc115211025)

[Figure 4.4‑c Front Panel - True 7](#_Toc115211026)

[Figure 4.4‑d Front Panel – False 7](#_Toc115211027)

# LabVIEW Programming Environment

## Objectives

* Learn the three parts of a VI
* Learn the three palettes
* Learn how data is passed in LabVIEW
* Distinguish between controls and indicators on the front panel and block diagram
* Learn how the Case Structure executes

## Equipment

Software

* *LabVIEW*



## Introduction

In this Lab, you will learn about the LabVIEW programming environment. You will also write a simple Virtual Instrument (VI) to incorporate basic operations and programming structures in LabVIEW. The structures featured include For Loops, While Loops, Case Structures, Sequence Structures, and Formula Nodes.

## Lab Instructions

All questions should be answered precisely to get maximum credit. Lab report must ensure following items:

* Lab objectives
* Results (Graphs/Tables/Pictures) duly commented and discussed
* Conclusion

# Lab Tasks

## Converting to

|  |  |
| --- | --- |
|  |  |
| Figure ‑ Block Diagram | Figure ‑ Front Panel |

**Comments:** In this task, we made use of a numeric control and two constants, along with an indicator to implement the following conversion function:

## Calculating the slope of a line

|  |  |
| --- | --- |
|  |  |
| Figure ‑ Block Diagram | Figure ‑ Front Panel |

**Comments:** In this task, we made us of 4 numeric controls and subtraction/division blocks to implement the function to compute slope, as expressed below:

## Calculator VI

|  |  |
| --- | --- |
| Figure ‑ Block Diagram | |
|  |  |
| Figure ‑ Operation Menu | Figure ‑ Front Panel |

**Comments:** In this task, we use the selector labels of the case structure to map common mathematical operations of a simple calculator to a ring control block. Following is the operation mapping sequence followed:

*0: Add (Default)*

*1: Subtract*

*2: Multiply*

*3: Divide*

*4: Square Root (of x)*

*5: Square (of x)*

Note: For square and square root, only the x numeric control is considered as the y numeric control is rendered useless for blocks that only take in a single input.

## Square Root VI

|  |  |
| --- | --- |
|  |  |
| Figure ‑ Block Diagram - True | Figure ‑ Block Diagram – False |
|  |  |
| Figure ‑ Front Panel - True | Figure ‑ Front Panel – False |

**Comments:** In this task we input a number, and then check if it is a negative number or not, if it is then it will display an error message. If the number is positive, the square root of the number is displayed.

# Questions

1. **What is a VI? What are the three main parts of a VI? Briefly describe each.**

**Answer:** A VI (Virtual Instrument, Extension .vi) is a LabVIEW proprietary file that is used to model a broad range of experiments and projects for designing/testing purposes. It’s three main parts are:

**Front Panel:** End-user interface; Analogous to input field in functional programming

**Block Diagram:** Block programming area; Analogous to coding files in functional programming

**Icon and Connector Pane:** Wrapper area; Analogous to inheritance/subroutines in functional programming

1. **What are the three palettes? Briefly describe each.**

**Answer:** Three palettes in LabVIEW are:

**Functional Panel:** Exclusive to block diagram; Used to create logic through the use of blocks

**Control Panel:** Exclusive to front panel; Used to provide UI enhancements

**Tools:** Common palette between both front panel and block diagram; Used to provide ease in placing/moving blocks

1. **How is data passed in LabVIEW?**

**Answer:** Data is passed in LabVIEW in a node like function. A node only executes when all of its inputs are available, and only provide data when the node has fully completed its execution. This can be wrangled to the programmer’s advantage if one is avid of functional programming.

1. **How can you tell the difference between controls and indicators on the front panel? On the block diagram?**

**Answer:** One can differentiate between controls and indicators on both the front panel and the block diagram by verifying the presence of the up-and-down arrow keys on the block (), as only control blocks have it.

1. **How does a Case Structure execute?**

**Answer:** A case structure executes analogous to an *if…elif…else* code in functional programming. A specific set of blocks executes only when the input logic matches the value of that present on the case structure.

# Conclusion

In this lab, we further extended our knowledge of LabVIEW, and we learned how to model a VI, which is a LabVIEW proprietary file which helps us implement and test a wide range of experiments. We used simple numerical numbers along with constants, to perform a series of operations such as addition and multiplication using appropriate blocks. We also learned about case structures and how to utilize them to perform a specific set of function depending on the logic fed into it. Using a case structure paired with a ring control to select the desired operation, we made a multi-functional calculator. We also got familiar with the three palettes and learned that data is passed in a node like function in LabVIEW.