Western Technical College

10662153 Introduction to LabVIEW

Course Outcome Summary

Course Information

Description	This course will provide an introduction to the basic LabVIEW software commands and programming used in data acquisition and control. LabVIEW will be used in conjunction with the National Instruments Educational Laboratory Instrumentation Suite (NI ELVIS). The student will perform experiments that collect and measure electrical signals from various transducers or interface circuitry and then store and process the data on the computer. During the data acquisition process, the output of digital or analog control signals to the interface circuitry will be used to provide feedback for circuit optimization and or adjustments.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree Courses
Total Credits	2
Total Hours	72

Textbooks

Learning with LabVIEW – with Access. 2nd Edition. Copyright 2021. Bishop, Robert H. Publisher: Pearson. **ISBN-13:** 978-0-13-582575-4. Required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.

Program Outcomes

1. Apply electronic theory to practice.
2. Operate test equipment.
3. Build electronic circuits and systems.
4. Evaluate the operation of electronic circuits or systems.
5. Communicate technical information.

6. Demonstrate effective programming skills.

Course Competencies

1. Use basic front panel and block diagram panel features.

Criteria

You will know you are successful when

1.1. you create a functioning front panel.
1.2. you connect the front panel controls and indicators using a block diagram.
1.3. you use toolbars functions to enhance front panel and block diagram features.
1.4. you use online help effectively.
1.5. you use VI libraries to help create programs more efficiently.

Learning Objectives

1.a. Use front panel tool bar
1.b. Use block diagram tool bar
1.c. Use pull-down menus
1.d. Use VI libraries and online help

2. Create a virtual instrument.

Criteria

You will know you are successful when

2.1. you use indicators correctly.
2.2. you use controls correctly.
2.3. you correctly connect nodes and terminals on the block diagram.
2.4. you create a working virtual instrument.
2.5. you create a working VI using a sub VI.

Learning Objectives

2.a. Utilize numeric and boolean controls when creating VI's
2.b. Utilize appropriate indicators when creating VI's
2.c. Understand the notion of data flow programming
2.d. Practice editing VI's using the debugging tools

3. Use timing functions properly.

Criteria

You will know you are successful when

3.1. you create a VI using the Wait ms function in a sequence structure.
3.2. you create a VI using the Tick Count ms function in a sequence structure.
3.3. you create a VI using the Time Delay Express VI.
3.4. you create a VI using the Elapsed Time Express VI.

Learning Objectives

3.a. Incorporate the wait time delay in a VI
3.b. Incorporate the wait until next time delay in a VI

4. Create a virtual instrument using Shift Registers.

Criteria

You will know you are successful when

4.1. you use shift registers to pass data stored from a previous iteration to the next.
4.2. you use shift registers to store data from the present iteration.
4.3. you correctly initialize the shift registers.

Learning Objectives

4.a. Utilize Shift Registers to store data from previous iterations
4.b. Initialize a Shift Register

5. Create a virtual instrument using For and or While loops.

Criteria

You will know you are successful when

5.1. you use a For Loop to perform a fixed number of iterations.
5.2. you use a For Loop to perform a fixed number of iterations determined by user input.
5.3. you pass data from inside the For Loop to outside.
5.4. you implement a While Loop that continues until the user stops the process.
5.5. you pass data from inside the While Loop to the outside.
5.6. you implement a While Loop that terminates internally.

Learning Objectives

5.a. Use a For loop to perform a fixed number of iterations
5.b. Use a For loop to perform a fixed number of iterations by user input
5.c. Use the iteration terminal in the For loop to display the present iteration
5.d. Pass parameters from inside to outside the For loop
5.e. Implement a While loop that continues until users stops iterations
5.f. Pass parameters from inside to outside the While loop
5.g. Implement a While loop the ends internally

6. Create a virtual instrument using Case and or Flat sequence structures.

Criteria

You will know you are successful when

6.1. you use a Boolean Case structure correctly.
6.2. you use a Numeric Case structure correctly.
6.3. you pass data from outside of the Case into the Case.
6.4. you pass data from inside of the Case to the outside of Case.
6.5. you use the add and delete frames feature.
6.6. you pass data from outside of the Flat sequence structure into the Flat sequence structure.
6.7. you pass data from inside of the Flat sequence structure to outside of the Flat sequence structure.
6.8. you differentiate between when to use a Stacked or a Flat sequence structure.

Learning Objectives

6.a. Use Boolean and Numeric Case structures
6.b. Use add Case after or add Case before feature
6.c. Use add and delete frames feature
6.d. Use Flat sequences structures
6.e. Use Stacked sequence structures

7. Create a virtual instrument using the formula node.

Criteria

You will know you are successful when

7.1. you use a formula node to solve an algebraic expression .
7.2. you use a formula node to solve a logarithmic expression.
7.3. you use a formula node to solve a conditional expression.

Learning Objectives

7.a. Use the formula node to program an algebraic expression
7.b. Use the formula node to program a logarithmic expression
7.c. Use the formula node to program a conditional expression

8. Create a virtual instrument using Cluster and or Arrays.

Criteria

You will know you are successful when

8.1. you implement a For Loop Array
8.2. you implement a While Loop Array.
8.3. you create a one-dimensional array.

8.4. you create a multi-dimensional array.
8.5. you create a VI the uses a Cluster of controls and indicators.
8.6. you use the bundle and unbundle function to simplify VI construction.

Learning Objectives

8.a. Implement arrays using a For Loop
8.b. Implement arrays using a While Loop
8.c. Create a one-dimensional array
8.d. Create a multi-dimensional array
8.e. Create a cluster of indicators and controls
8.f. Use the bundle function to group items in a cluster
8.g. Use the unbundle function to ungroup items in a cluster

9. Construct charts and graphs.

Criteria

You will know you are successful when

9.1. you create a VI that uses a single-plot chart.
9.2. you create a VI that uses a multi-plot chart.
9.3. you determine the correct application of either a chart or graph.
9.4. you create a VI that uses a single-plot graph.
9.5. you create a VI that uses a multi-plot graph.
9.6. you customize graphs or charts for a specific application.

Learning Objectives

9.a. Construct a VI that uses a single-plot chart
9.b. Construct a VI that uses a Multi-plot chart
9.c. Differentiate between charts and graphs
9.d. Construct a VI that uses a single-plot graph
9.e. Construct a VI that uses a Multi-plot graph
9.f. Use the editing features to enhance the appearance of charts and graphs

10. Create a basic data acquisition and control program and system.

Criteria

You will know you are successful when

10.1. you identify the DAQ device, the sensors, the transducers, the signal conditioner and the software of a DAQ system.
10.2. you state the five types of signal that can be found in a DAQ system.
10.3. you list six types of transducers and the conditioning need for each.
10.4. you create a program that inputs an analog signal.
10.5. you create a program that outputs an analog signal.
10.6. you create a program the inputs a digital signal.
10.7. you create a program that outputs a digital signal.
10.8. you implement a basic data acquisition and control system using DAQmx.

Learning Objectives

10.a. Identify the components that make up a DAQ system
10.b. Identify the types of signals that are input or output from a DAQ system
10.c. List common transducers used in data acquisition systems
10.d. List common types of signal conditioning needed for each type of transducer
10.e. Develop a program that inputs and outputs an analog signal
10.f. Develop a program that inputs and outputs a digital signal
10.g. Implement a basic data acquisition and control system using DAQmx

11. Solve linear systems of equations using LabVIEW.

Criteria

You will know you are successful when

11.1. you create a 2 X 2 matrix.
11.2. you create a 3 X 3 matrix.

11.3. you solve a 2 X 2 system of equations.
11.4. you solve a 3 X 3 system of equations.
11.5. you use the linear system VI's to correctly solve the system of equations.

Learning Objectives

11.a. Use real matrix control
11.b. Use complex matrix control
11.c. Use matrices to solve systems of linear equations
11.d. Use linear system VI's

12. Integrate Multisim data into LabVIEW.

Criteria

You will know you are successful when

12.1. you create a Multisim circuit file and saves it as a LabVIEW measurement file.
12.2. you wire the circuit on the ELVIS proto board.
12.3. you create a LabVIEW program that will read the circuit data from the ELVIS board.
12.4. you perform circuit optimization based on the comparison of the actual data and the simulated data.
12.5. you formulate conclusions based on the comparison of the actual data and the simulated data.

Learning Objectives

12.a. Use Multisim to create simulated circuit data
12.b. Use the ELVIS proto board to create the actual circuit
12.c. Use the read measurement file express VI to compare the real with the simulated data