

**ELEC 180 Course Outline as of Fall 2020****CATALOG INFORMATION**

Dept and Nbr: ELEC 180 Title: LABVIEW FOR TECHNICIANS

Full Title: LabVIEW for Technicians

Last Reviewed: 4/22/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.50	17.5	Lecture Scheduled	43.75
Minimum	3.00	Lab Scheduled	1.50	8	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 87.50

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

**Catalog Description:**

Fundamentals of computerized data acquisition and programmable instrument control using National Instruments LabVIEW graphical programming software. Topics include building virtual instruments (VI), using control structures, using analog and digital signal generators, performing signal processing and analysis, creating charts and graphs, implementing instrument control and data acquisition. Includes an introduction to circuit simulation using National Instruments Multisim.

**Prerequisites/Corequisites:****Recommended Preparation:****Limits on Enrollment:****Schedule of Classes Information:**

Description: Fundamentals of computerized data acquisition and programmable instrument control using National Instruments LabVIEW graphical programming software. Topics include building virtual instruments (VI), using control structures, using analog and digital signal

generators, performing signal processing and analysis, creating charts and graphs, implementing instrument control and data acquisition. Includes an introduction to circuit simulation using National Instruments Multisim. (Grade or P/NP)

Prerequisites/Corequisites:

Recommended:

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	Effective:	Inactive:
<b>CSU GE:</b>	<b>Transfer Area</b>	Effective:	Inactive:

<b>IGETC:</b>	<b>Transfer Area</b>	Effective:	Inactive:
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<b>CSU Transfer:</b>	Effective:	Inactive:
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<b>UC Transfer:</b>	Effective:	Inactive:
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**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

**Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Design and build virtual instruments (VI).
2. Perform signal generation and measurement using LabVIEW data acquisition tools.
3. Identify and correct VI program errors.

**Objectives:**

Students will be able to:

1. View pre-existing virtual instruments in LabVIEW.
2. Design and build virtual instruments using the LabVIEW environment.
3. Identify and correct virtual instrument program errors.
4. Design and build sub-virtual instruments.
5. Design and build virtual instruments that employ conditional and repetitive control structures.
6. Create array controls and indicators.
7. Create and customize waveform charts and graphs.
8. Generate and measure analog and digital signals by using the data acquisition tools in LabVIEW.
9. Create string manipulation functions.
10. Write to and read data from a file.
11. Design and build virtual instrumentation for signal generation and processing.
12. Detect, configure, and control an external instrument using LabVIEW.
13. Simulate electronic circuitry using Multisim.

## Topics and Scope:

### I. LabVIEW Basics

- A. The LabVIEW environment
- B. Opening, loading, and saving virtual instruments

### II. Virtual Instruments (VI)

- A. The front panel
- B. The block diagram
- C. Building a VI
- D. Data flow programming

### III. Editing and Debugging Virtual Instruments

- A. Editing techniques
  - 1. Creating controls and indicators on the block diagram
  - 2. Selecting, moving and resizing objects
  - 3. Selecting and Deleting Wires
- B. Debugging Techniques
  - 1. Finding errors
  - 2. Single stepping through a VI and its subVIs
  - 3. Breakpoint and probes

### IV. SubVIs

- A. Editing the icon and connector
- B. Using a VI as a subVI
- C. Creating a subVI

### V. Structures

- A. The for loop
- B. The while loop
- C. Shift registers and feedback nodes
- D. Case structures
- E. Common problems in wiring structures

### VI. Arrays and Clusters

- A. Arrays
- B. Creating arrays with loops
- C. Array functions
- D. Clusters

### VII. Charts and Graphs

- A. Waveform charts and graphs
- B. XY graphs
- C. Customizing charts and graphs

### VIII. Data Acquisition (DAQ)

- A. Components of a DAQ system
- B. Types of signals
- C. Analog to digital conversions
- D. DAQ hardware configuration
- E. Analog input/output
- F. Digital input/output

### IX. String and File Input/Output (I/O)

- A. String conversions
- B. File I/O
- C. Analysis
- D. Signal generation
- E. Signal processing

### X. Instrument Control

- A. Components of an instrument control system
- B. Detecting and configuring instruments
- C. Instrument drivers

XI. Multisim Basics

- A. Open and run existing multisim files
- B. Using the multisim tools

XII. Laboratory Topics

- A. Using the LabVIEW environment
- B. Programming a simple VI
- C. Editing and debugging techniques
- D. Using a subVI
- E. Programming control structures
- F. Using arrays and clusters
- G. Using a DAQ system
- H. File input and output
- I. Controlling an Instrument

**Assignment:**

Lecture-Related Assignments:

1. Assigned reading (20-35 pages per week)
2. Computer programs and documentation (3 per week)
3. Quizzes (2-4)
4. Final project: Create VI computer program and associated documents

Lab-Related Assignments:

1. Laboratory exercises (6-10)

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.

Writing  
0 - 0%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Computer programs and documentation

Problem solving  
20 - 30%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Laboratory assignments

Skill Demonstrations  
20 - 30%

**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes and final project

Exams  
30 - 60%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

Participation

Other Category  
0 - 10%

**Representative Textbooks and Materials:**

Hands-on introduction to LabVIEW for scientists and engineers. 4th edition, Essick, John, Oxford University Press, (2019)